

ADDITIONAL

LEAF EXTRACTS

LEAF EXTRACTS
CONTAINING
METHYL
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predictive damage models, in order to bypass the tedious experimental requirements for generating damage data. The predictive ability of the best of these models, the junction capacitance damage model, is investigated in detail.

Central to this study is a library of experimental damage data for 46 silicon device types, comprising bipolar transistors and diodes tested at the 10-, 1-, and 0.1- μ s pulse durations. These are devices from the front ends of a number of Army systems and represent radio, field wire, and cable functions with operating ranges in the direct current (dc) to microwave region. Of the 46 experimental devices comprising 68 junction types (collector-to-base and emitter-to-base junctions treated as distinct for all transistors), sufficient published manufacturers' data were available for the damage modeling of 11 junctions. These were supplemented with measured parameters for 27 junction types. No measurable difference was observed between the model's predictive capability by using the experimental parameters and that by using manufacturers' model parameters. The ratios of experimental power to damage (for all tested pulse durations) to predicted value span a range from 0.00077 to 18--a skewed distribution, with 59 percent of all predicted values being overestimates of the power to damage.

With only 16 percent of the test-device population having sufficient published parameters to allow the junction capacitance damage model to be used, it is a valuable exercise to develop alternative, simpler damage models--not so much as a substitute for the junction capacitance model, but rather as a standard for comparison. The first considered was the dc power rating model. It was based on the supposition that there is some correlation between dc power ratings and transient power to damage. No distinction was made in the development of this model between forward or reverse dc ratings. The resultant model was applicable to 88 percent of the test-device population (based on published parameters) and demonstrated an agreement with the experimental power-to-damage data that was approximately two to four times poorer than the junction capacitance model. A second model was developed based on the manufacturers' rating of devices as high power or low power. This model considered the entire population of bipolar transistors and diodes (excluding microwave devices) as equitable to either of two devices with damage constants of 0.089 and 6.1 W-s^{1/2}. This model was applicable to 90 percent of the test population and demonstrated the same level of correlation with the experimental damage data as did the junction capacitance damage model.

A comparison of the predictive capability of the junction capacitance damage model with the scatter in the experimental damage data indicates that the use of the failure model requires an order of magnitude larger conservatism in the lower bounding of device failure than the use of an experimentally established damage curve.

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1. INTRODUCTION

Component transient damage data are an integral part of any comprehensive program of electromagnetic pulse (EMP) vulnerability assessment and hardening. In general, semiconductor devices represent the most vulnerable of components and are the devices that have received the most intensive study. With approximately 75,000 bipolar transistor and diode types alone (of which approximately 2000 have military specifications), experimental damage data, data available only as a result of dedicated efforts, can be expected to be available for only a minor fraction of semiconductor devices. This limitation has spurred efforts to bypass the tedious experimental requirements to generate damage data by developing predictive damage models. Three semiempirical damage models are presently in general use.¹ These are designed to predict the failure level of bipolar transistors and diodes under conditions of reverse bias. There is amassed in the literature much information on the predictive ability of these models, much of it sketchy with no well defined standards for drawing a comparison and some of it contradictory. Based on the most exhaustive of these studies, there appears no clearly superior model.²

The purpose of this study is to focus on one of these, the junction capacitance damage model, and to attempt to establish some standards whereby the user can judge its adequacy. Central to this examination is a library of experimental damage data for 59 device types generated for the Army's former Multiple Systems Evaluation Program. These represent transistors and diodes incorporated into the front ends of a number of tactical single and multichannel radios, associated with circuits operating from the direct current (dc) to the microwave region. These data are taken from the unpublished work of Bruno Kalab of the Harry Diamond Laboratories.

This study is a narrowly defined investigation of the predictive ability of the junction capacitance damage model. It must always be borne in mind that, when the adequacy of the model is judged, it must be considered within the context of all sources of error in a program of EMP vulnerability assessment and hardening. Since model accuracy is a subjective quantity to be measured by the particular needs of the user, no conclusions are to be drawn. Rather, a set of standards is to be developed whereby the effectiveness of the model for particular applications can be judged.

¹DNA EMP (Electromagnetic Pulse) Handbook (U), Defense Nuclear Agency DNA 2114H (July 1979). (CONFIDENTIAL)

²D. R. Alexander, G. L. Brown, and J. B. Almassy, Electromagnetic Susceptibility of Semiconductor Components, Air Force Weapons Laboratory AFWL-TR-74-280 (September 1975).

2. EXAMINATION

Most predictive failure models for semiconductors are based on the work by Wunsch and Bell.³ Based on a thermal model for failure, Wunsch and Bell developed the expression

$$P_D = Kt^{-N} , \quad (1)$$

where P_D is the power to failure for a square pulse, K is a constant characteristic of the device (damage constant), t is the duration of the power pulse, and, for the Wunsch-Bell form of equation (1), $N = 0.5$. This value for N is treated as valid for junction reverse bias in at least the 0.1- to 10- μ s range. It was observed that there existed a measure of correlation between power to damage and P-N junction area. From this observation were developed three analytical models for predicting device failure (under reverse bias) based on manufacturers' specifications.⁴ The first two are called thermal resistance models and are based on a simple resistance-capacitance (R-C) network for which heat flow from the junction area is treated as an analog of current, and temperature drop is treated as an analog of electric potential.

The thermal resistance models (incorporated into the Wunsch-Bell equation) are

$$P_D = A_1 \theta_{JC}^{-B_1 t^{-0.5}} , \quad (2)$$

$$P_D = A_2 \theta_{JA}^{-B_2 t^{-0.5}} , \quad (3)$$

where A_1 , A_2 , B_1 , and B_2 are experimentally determined constants and

$$\theta_{JC} = \frac{T_{J(MAX)} - T_C}{P_D} , \quad (4)$$

³D. C. Wunsch and R. R. Bell, Determination of Threshold Failure Levels of Semiconductor Diodes and Transistors due to Pulse Voltages, IEEE Trans. Nucl. Sci., NS-15 (December 1968), 244-259.

⁴D. C. Wunsch, R. L. Cline, and G. R. Case, Semiconductor Vulnerability, Phase II Report, Theoretical Estimates of Failure Levels of Selected Semiconductor Diodes and Transistors, Braddock, Dunn and McDonald, Inc., Albuquerque, NM, BDM/A-42-69-R (August 1970).

$$\theta_{JA} = \frac{T_{J(MAX)} - T_{AMB}}{P_D}, \quad (5)$$

where $T_{J(MAX)}$ is the maximum operating junction temperature and P_D is the total power dissipation at case temperature "C or ambient temperature T_{AMB} .

The junction capacitance model is based on the relationship between junction area and capacitance. The form of this model (incorporated into the Wunsch-Bell equation) is

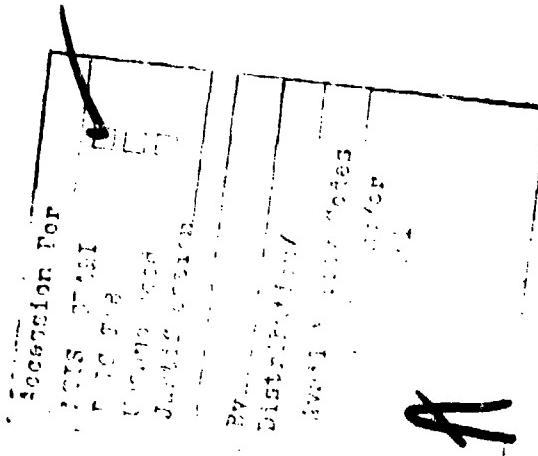
$$P_D = A_3 C_j V_{BD}^{B_3 t^{-0.5}}, \quad (6)$$

where A_3 and B_3 are experimentally established constants, C_j is junction capacitance, and V_{BD} is junction breakdown voltage.

To reasonably test model predictions, a representative sample of experimental data is essential. The term "representative" is used advisedly since a small sample taken from a large population must be chosen carefully. All devices are taken from the front ends of an array of Army communications systems. These interface circuits represent radio, field wire, and coaxial cable functions. No devices were prescreened. Instead, all devices were selected on the basis of their proximity to the EMP coupling source with no exclusion on the basis of potential power handling capability, and all devices were chosen without regard to previously published device data. This latter condition insured that all devices were tested employing the same methodology and the same standards. All devices were obtained from federal stocks over a number of years without regard to manufacturer, device lot, or supplier. To the extent that such a selection process defines a general device population selected from among the types of devices of most interest in a transient damage analysis, then the test population can be called representative.

3. RESULTS

This device population (to be referred to as the standard population) was employed in this study:



Silicon devices

2N326A(C-B)	1N752A	CA3018(E-B)
2N328A(E-B)	PC115	SMB52617(C-B)
2N335(C-B)	1N3026B: JAN	SMB52617(E-B)
2N335(E-B)	1N3611	2N1613: JAN(C-B)
2N336: JAN(C-B)	1N3995A	2N1613: JAN(E-B)
2N336: JAN(E-B)	1N3016B	2N1485: JAN(C-B)
2N2484(C-B)	1N4141	2N1485: JAN(E-B)
2N2484(E-B)	10D2	2N3439(C-B)
2N3736(C-B)	2N2857(C-B)	2N3439(E-B)
2N3736(E-B)	2N2857(E-B)	2N706: JAN(C-B)
2N930(C-B)	2N3375(C-B)	2N706: JAN(E-B)
2N930(S-B)	2N3375(E-B)	1R-69-6735
2N2481(C-B)	2N1490: JAN(C-B)	1N2580
2N2481(E-B)	2N1490: JAN(E-B)	1N571A: JAN
2N2907A(C-B)	2N3584(C-B)	1N485B: JAN
2N2907A(E-B)	2N3584(E-B)	1N2991B: JAN
2N2222A(C-B)	2N2894(C-B)	1N3015B: JAN
2N2222A(E-B)	2N2894(E-B)	MO1054
1N4384	2N5829(C-B)	1N746A: JAN
FS911-3465	2N5829(E-B)	1N645: JAN
1N816	2N3013: JAN(C-B)	1N1202RA: JAN
1N21WE	2N3013: JAN(E-B)	1N1731A: JAN
1N914A	CA3018(C-B)	

Germanium devices

2N404A(C-B)	2N396A(E-B)	2N705: JAN(E-B)
2N404A(E-B)	2N428M: JAN(C-B)	2N465M: JAN(C-B)
2N297A(C-B)	2N428M: JAN(E-B)	2N466M: JAN(E-B)
2N297A(E-B)	2N393: JAN(C-B)	2N1042RA: JAN(C-B)
2N526(C-B)	2N393: JAN(E-B)	2N1042RA: JAN(E-B)
2N526(E-B)	2N501A: JAN(C-B)	1N277: JAN
1N270	2N501A: JAN(E-B)	MS1040
2N396A(C-B)	2N705: JAN(C-B)	

Separate collector-to-base (C-B) and emitter-to-base (E-B) damage characteristics for all transistors yield 91 P-N junction types. Power-to-failure curves are available for these devices in the 0.1- to 10- μ s

range, with some exceptions. If, for the devices with damage data in the aforementioned range, a fit is made to equation (1), the histogram for N given in figure 1 results.

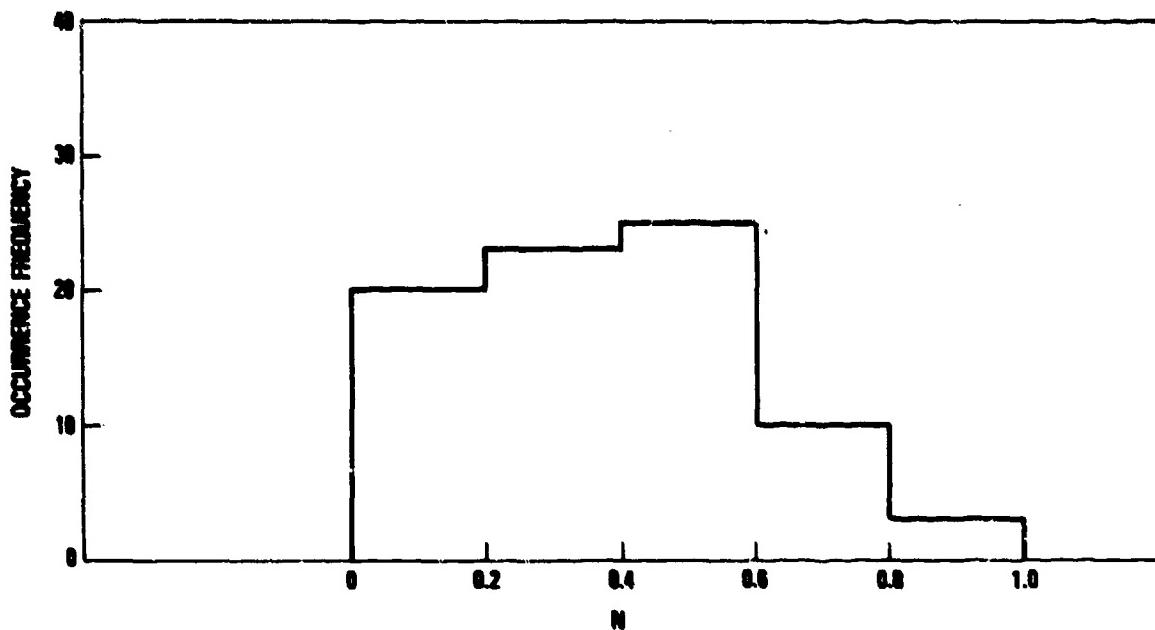


Figure 1. Histogram of N from damage equation $P_D = k t^{-N}$ for standard population fitted in 0.1- to 10- μ s range.

It will prove important for this study to consider the spread in the standard population power to damage and to have damage values for all tested devices. Because of test equipment limitations, some of the devices were undamageable, particularly for the shortest pulses. All testing was performed about the 0.1-, 1-, and 10- μ s pulse durations. For devices with data missing at the 0.1- μ s pulse duration, it becomes a simple matter to extrapolate from the 1- and 10- μ s data. An examination of all data revealed that extrapolation could be done with a high level of confidence; as a consequence, no distinction is made between these extrapolated data and measured data. For devices with data missing at the 0.1- and 1- μ s pulse durations, extrapolation becomes much less accurate. By relying on equation (1), data at 10 μ s can be used to extrapolate to 0.1 and 1 μ s:

$$\frac{P_D(1 \mu s)}{P_D(10 \mu s)} = \left(\frac{1}{10}\right)^{-N} \quad \text{and} \quad \frac{P_D(0.1 \mu s)}{P_D(10 \mu s)} = \left(\frac{1}{100}\right)^{-N}. \quad (7)$$

The choice of N is critical. Figure 1 indicates a value anywhere between 0 and 1. If $N = 0.5$ is chosen, then this results in a maximum error at the 1- μs pulse duration of a factor of 3.16 and at the 10- μs pulse duration of a factor of 10. For some devices, the maximum no-damage pulse power is used to improve upon these potential error factors in the choice of extrapolated damage levels. The final situation is no power-to-damage data for any pulse duration. This occurred with a single device (1N3995A). For this device, the junction capacitance model was used to predict damage. The predicted value is compatible with the maximum no-damage power pulse. This compatibility represents the unusual situation of using a model to contribute to a distribution that is part of a test of the model. The predicted value was included since it was considered more important to achieve a complete set of data for the standard device distribution than to be concerned with a single anomalous point. Beyond this distribution, little further use is made of the 1N3995A damage data. The resultant distributions for the standard device population are given in figures 2 through 4. The power-to-damage values for the individual devices are given in appendix A. Sources of uncertainty in the experimental damage data can be classified as these:

- a. The natural variability in the levels to failure in any population used to define a damage curve
- b. The deviation in the makeup of the test population from that which is representative of a population of interest to the user

There is no way that a study can come to terms with the latter source of uncertainty, except to anticipate the interest of the greatest number of users and to select a population accordingly. The former source can be described by using standard error theory. In anticipation of a more detailed description of the level of variability in the test population later in the report, figure 5 presents as a histogram the range in the data defined as

$$V'/V, \text{ for } V' > V,$$

or

$$V/V', \text{ for } V > V',$$

where V' is the experimental damage data point with the largest deviation from the damage curve and V is the corresponding value from the damage curve. These are values for all device types of the standard test population under reverse bias. Figure 5 represents the maximum deviation from the experimentally defined damage curve for a typical population of 9 to 15 tested components.

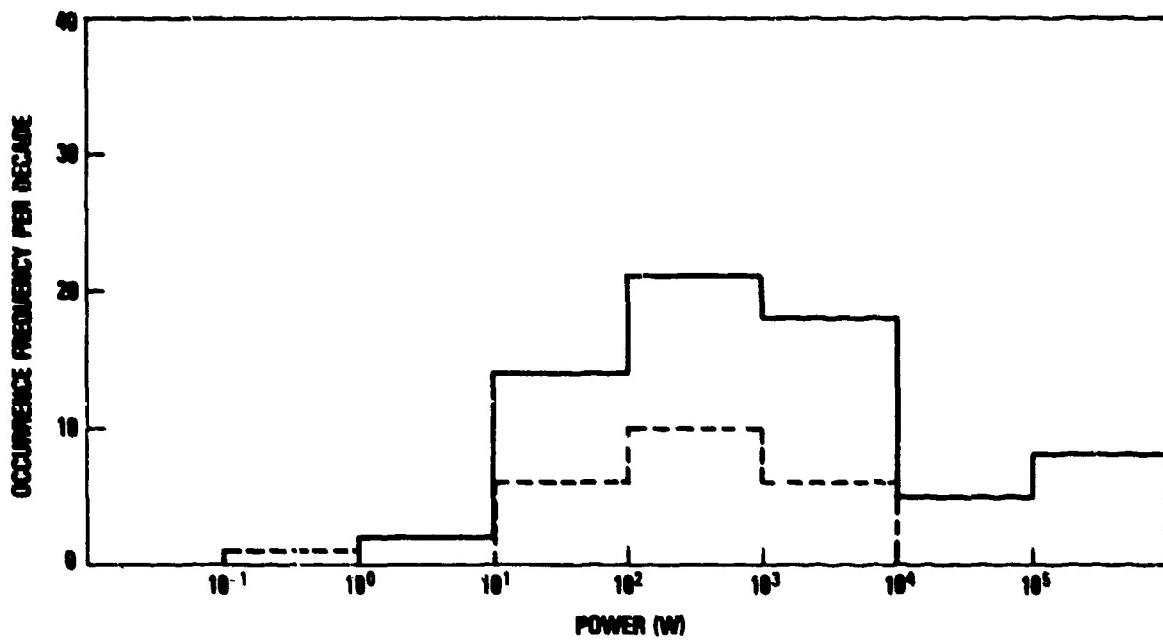


Figure 2. Histogram of experimental power to damage for pulse duration of $0.1 \mu\text{s}$ for silicon devices of standard population (solid curve) with superimposed curve for germanium devices (dashed curve).

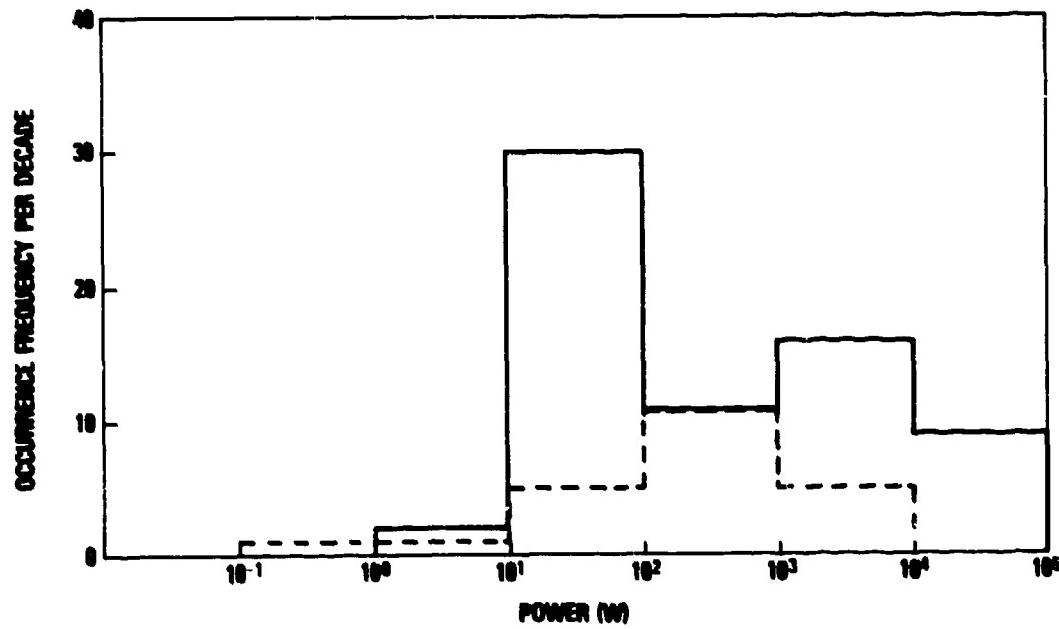


Figure 3. Histogram of experimental power to damage for pulse duration of $1 \mu\text{s}$ for silicon devices of standard population (solid curve) with superimposed curve for germanium devices (dashed curve).

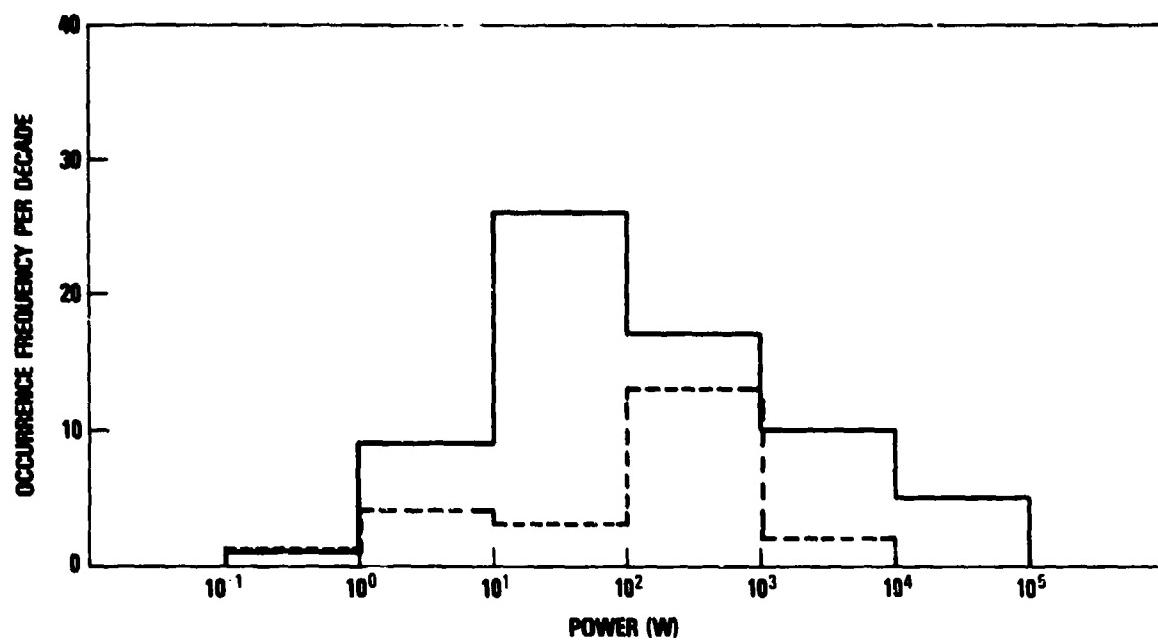


Figure 4. Histogram of experimental power to damage for pulse duration of $10 \mu\text{s}$ for silicon devices of standard population (solid curve) with superimposed curve for germanium devices (dashed curve).

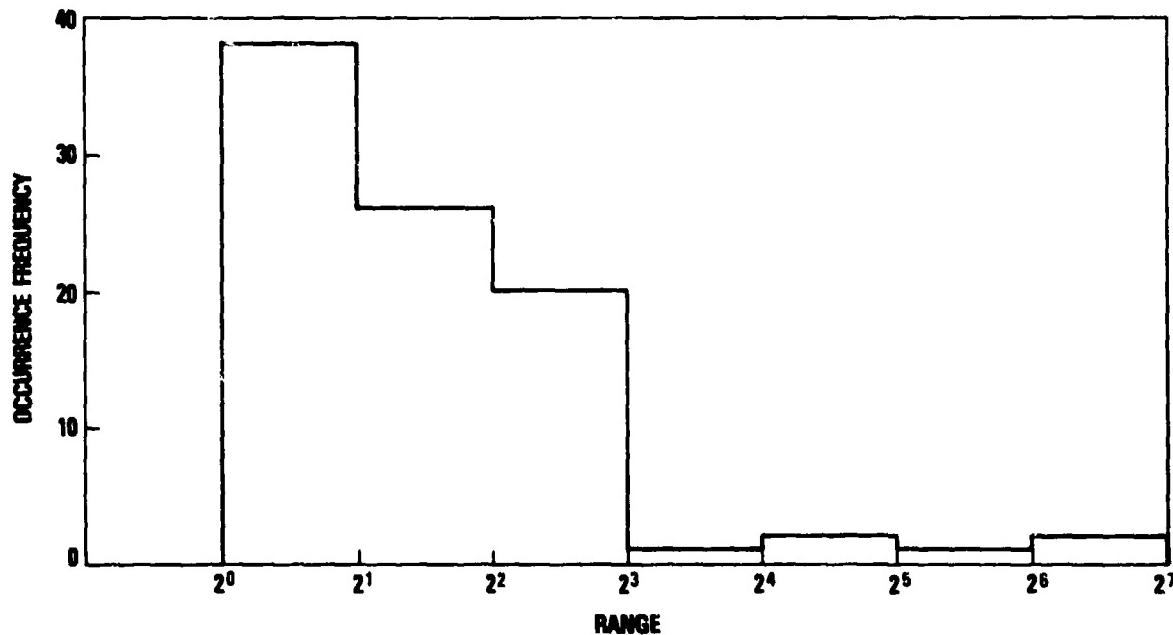


Figure 5. Histogram of maximum deviation of device damage from experimentally established damage curve for all devices of standard population defined as ratio with corresponding point on damage curve.

The most recent form of the junction capacitance damage model, including the experimentally established constants, is given in table 1. A number of difficulties are encountered in applying this model to the standard device population. The model is not applicable to germanium devices. For all silicon transistors, a knowledge of device construction is required--a quantity that is sometimes difficult to obtain from the literature. Similarly, junction capacitance and breakdown voltage are often unobtainable. For transistors, these parameters are rarely available for the base-to-emitter junction. The consequence is that the model, based on published device parameters, is applicable to only 12 percent of the standard device population. If germanium devices are excluded from the standard population, this figure increases to 16 percent. To supplement missing data, experimentally established parameters for junction capacitance and breakdown voltage were employed. These increased the size of the silicon standard population to which the model was applicable to 47 percent.

TABLE 1. JUNCTION CAPACITANCE DAMAGE MODEL

Devices	$K = Pt^{1/2}$
Diodes and nonplanar silicon transistors	$K = 4.97 \times 10^{-3} C_J V_{BD}^{0.57}$
Mesa and planar silicon transistors	$K = 1.66 \times 10^{-4} C_J V_{BD}^{0.992}$

Note: For transistors, $C_J = C_{ob}$ and $V_{BD} = BV_{cbo}$.
Source: DNA EMP (Electromagnetic Pulse) Handbook (U), Defense Nuclear Agency DNA 2114H (July 1979). (CONFIDENTIAL)

It has been reported in the literature that little improvement in the predictive capability of this junction capacitance damage model occurs when experimental input parameters are substituted for published values.² This study supports that conclusion. To compare the predictive capability of the model using experimental and published parameters, the data are presented in two formats. The quantities presented are not the predicted values, but rather the scatter in the

²D. R. Alexander, G. L. Brown, and J. B. Almassy, Electromagnetic Susceptibility of Semiconductor Components, Air Force Weapons Laboratory AFWL-TR-74-280 (September 1975).

predicted values defined as the ratio of the experimental power to damage to the predicted value. These data are presented as a histogram of the population distribution in figure 6. They are presented also as a function of the percentage confidence level. The percentage confidence level is defined as the percent of the subject population with a scatter less than or equal to the given value. For this mode of presentation, the scatter is given as the spread in the data without regard to whether the predicted value is greater or less than the experimental value. This means that for values of the predicted-to-experimental ratio for damage less than 1, the data presented are the inverse of this ratio. This mode of presentation provides a convenient way to judge the utility of the model based on the varying degrees of confidence required by the diversity of potential model users. The corresponding curves for the experimental and published model parameters are given in figure 7.

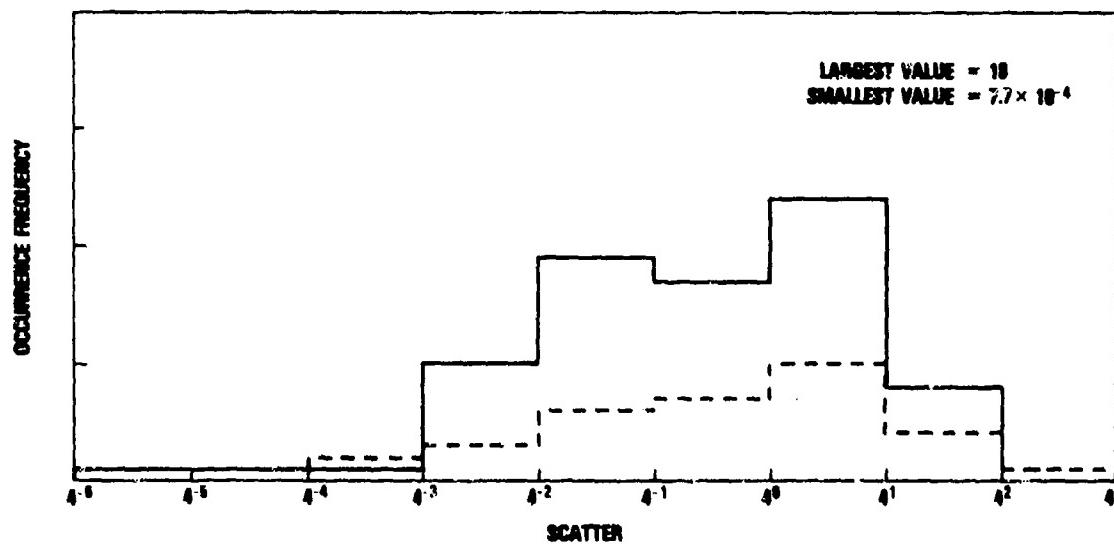


Figure 6. Superimposed histograms of ratio of experimental power to damage to predicted value based on junction capacitance damage model: experimental parameters for junction capacitance and breakdown voltage (solid curve) and manufacturers' parameters (dashed curve).

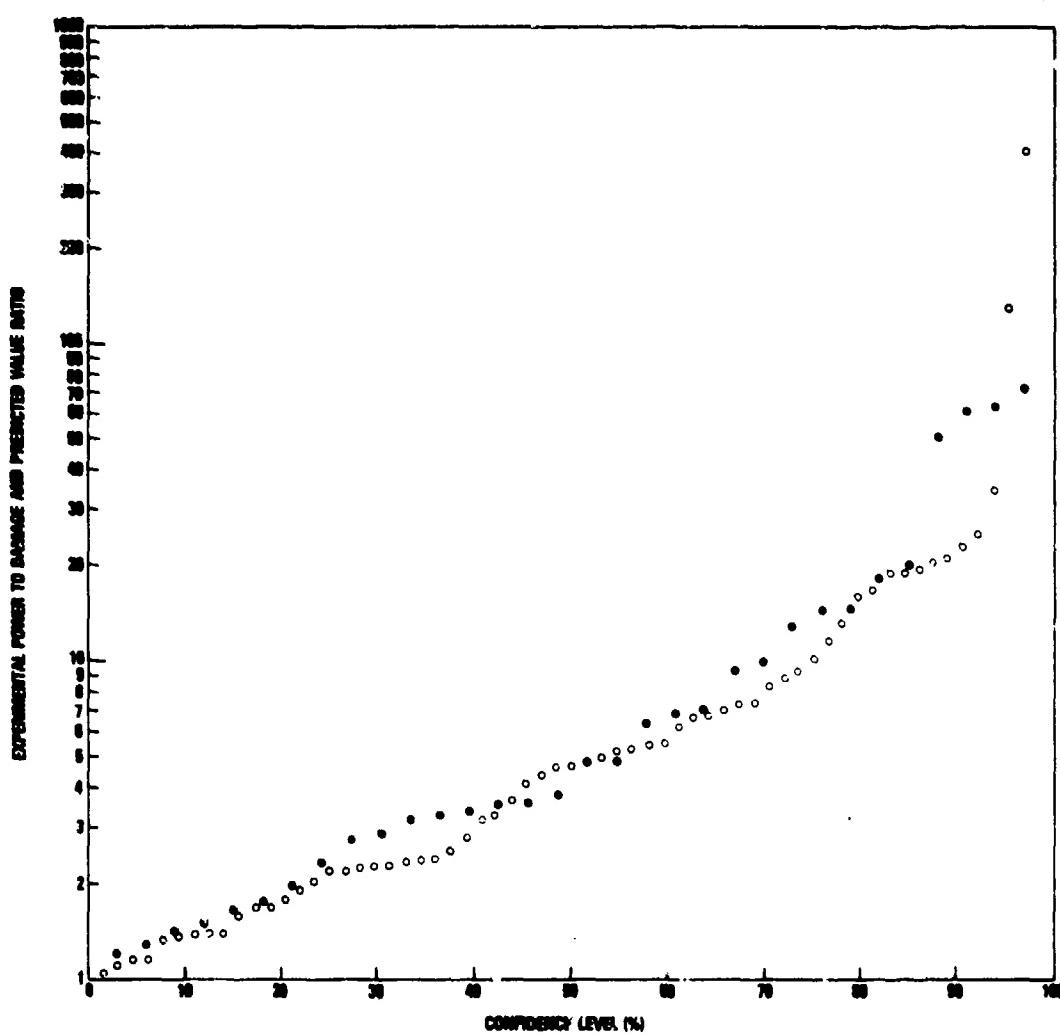


Figure 7. Confidence level for junction capacitance damage model test of standard population: published parameters (solid circles) and experimental values for junction capacitance and breakdown voltage (open circles); all extrapolated values for experimental damage data are excluded from standard population.

All further reference to the predictions of the junction capacitance damage model is to a composite of data corresponding to the model predictions based on experimental parameters plus those several devices not included in this lot for which sufficient published parameters were available. The device population can be ascertained from the data

presented in appendix A. This composite curve is presented in figure 8 for the standard population both including and excluding the extrapolated experimental damage values.

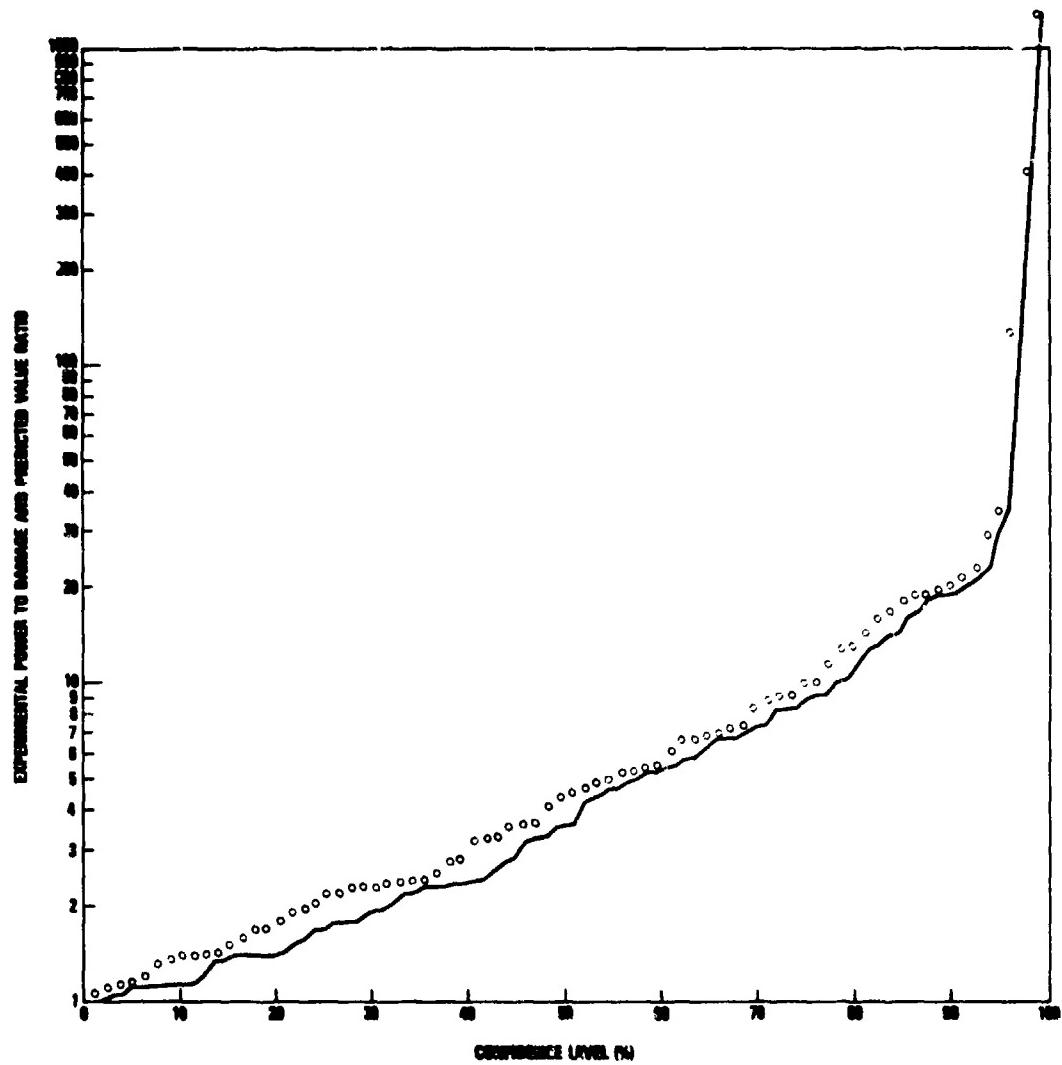


Figure 8. Confidence level for junction capacitance damage model test of composite standard population: all extrapolated values for experimental damage data are excluded from standard population (circles) and extrapolated values are included (solid curve).

Much of the convenience of the junction capacitance model is lost because of the limited availability of the requisite published parameters. It is an informative exercise to test the performance of the junction capacitance model by constructing alternative, simpler damage models. The basis for the junction capacitance damage model was the observation that there appeared to be a correlation between junction area and transient power level to damage. It is not an unreasonable supposition to theorize some measure of correlation between device dc power rating and transient power level to failure. This model is to be referred to as the dc power rating model. Since this model is being proposed not so much as a potentially more accurate substitute, but rather as a standard for comparing the junction capacitance model, rigor is sacrificed for convenience of use and general applicability. Since devices such as rectifiers have power ratings for forward bias and devices such as reference diodes have power ratings for reverse bias, no distinction is to be made between forward or reverse bias in developing the model. For diodes without power ratings, but with a maximum rated current, a power rating is derived by selecting a reasonable corresponding junction potential. Similarly, power ratings for transistors are assumed to apply to the C-B and the E-B junctions. By these standards, sufficient published data are available to apply such a model to 88 percent of the standard silicon device population.

To develop and test the dc power rating model, the standard silicon device population is divided into two groups. Population A (containing approximately half the devices) is that segment lacking sufficient information to apply the junction capacitance damage model, but for which dc power ratings (as previously defined) exist. Population B is the same as population A, but contains those devices to which the junction capacitance damage model is applicable. By using population A to develop the dc power rating model and population B to test its predictive capability, a good comparison of the alternative damage models becomes possible. Since experimental data for constructing the model are available about the 0.1-, 1-, and 10- μ s pulse durations, a particularly simple model to fit these data is of the form

$$P_D/P_{DC} = A_1 t^{-1} + A_2 t^{-1/2} + A_3 \quad , \quad (8)$$

where P_D is the average power to damage for population A devices at pulse duration t and P_{DC} is the corresponding average dc power rating. Although an equation of the form of equation (8) can be readily fitted to the device data, care must be used in extrapolating this relationship beyond the pulse durations used for the fit. For data at 0.1, 1, and 10 μ s, constants A_1 , A_2 , and A_3 become (t in units of s)

$$A_1 = 5.1 \times 10^{-7} \frac{P_D(10 \mu s)}{P_{DC}} - 6.7 \times 10^{-7} \frac{P_D(1 \mu s)}{P_{DC}} \quad (9)$$

$$+ 1.6 \times 10^{-7} \frac{P_D(0.1 \mu s)}{P_{DC}},$$

$$A_2 = -2.1 \times 10^{-3} \frac{P_D(10 \mu s)}{P_{DC}} + 2.3 \times 10^{-3} \frac{P_D(1 \mu s)}{P_{DC}} \quad (10)$$

$$- 2.1 \times 10^{-4} \frac{P_D(0.1 \mu s)}{P_{DC}},$$

$$A_3 = 1.6 \frac{P_D(10 \mu s)}{P_{DC}} - 0.68 \frac{P_D(1 \mu s)}{P_{DC}} + 0.052 \frac{P_D(0.1 \mu s)}{P_{DC}} \quad (11)$$

The choice of the ratios of P_D/P_{DC} is based on the nature of the experimental device population. To choose as the ratios of P_D/P_{DC} the average of the selected population requires careful consideration of the definition to be applied to average. The device experimental damage data population is not a normal distribution, and included within this distribution are a number of devices with extrapolated powers to damage. If the average value for P_D/P_{DC} is taken as the arithmetic mean of the distribution, then the error inherent in the extrapolated values, values clustered at the high power end of the distribution, poses the possibility of an average value unrepresentative of the actual population. If the average value is taken as the median value of the distribution, then the uncertainty of the extrapolated values (if their number count is not too large) is eliminated, but at the risk that the median is not the value most representative of the population. Because of these uncertainties, both the arithmetic mean and the median are to be used for all modeling. The values developed to these standards for A_1 , A_2 , and A_3 for population A are given in table 2. The junction capacitance damage model and the dc power rating model applied to population B are compared in figure 9.

The correlation to be drawn between these curves is a function of the confidence level desired in the predictions. It is clearly beyond the scope of this study, being based on a limited data base, to approach the 100-percent level. Although all curves are extended to values approaching 100 percent, this extension is based on very few data

points. The consequence is that caution must be exercised in interpreting into the high confidence region. In the 50- to 90-percent confidence range, the dc power rating model yields a correlation with the experimental power to damage two to four times poorer than the junction capacitance damage model.

TABLE 2. CONSTANTS A_1 , A_2 , AND A_3 FOR
DIRECT CURRENT POWER RATING MODEL P_D/P_{DC}
 $= A_1 t^{-1} + A_2 t^{-1/2} + A_3$

Statistic	A_1 (W-s)	A_2 (W-s ^{-1/2})	A_3 (W)
Arithmetic mean	5.58×10^{-4}	0.309	34.2
Median	9.87×10^{-6}	0.101	22.7

An examination of the spread in the junction capacitance damage model predictions and the spread in the damage data of figures 2 to 4 indicates that it should be possible to define two power levels that cover the range of experimental damage data with a spread comparable to that of the junction capacitance model. As an attempt at such a model, which is called the power class model, all devices are classified as either high or low power devices based on published data.* Transistors are routinely classified as either high or low power--the dividing line, with some exceptions, is a power rating of 1 W. If the same 1-W standard is applied to diodes, then the semiconductor population can be divided into two classes. For model development for those diodes without a power rating, all rectifiers, silicon reference diodes, and varistors are considered high power, and the remaining devices are considered low power. This division results in a model applicable to 90 percent of the standard silicon device population.

*The single exception in this model is microwave class devices. Because of their very low power rating, the preferred model is divided into three power categories. With few data available on transient failure of microwave devices (the standard silicon device population contains one microwave device, the 1N21WE), the best that can be done with the present study is to exclude this category.

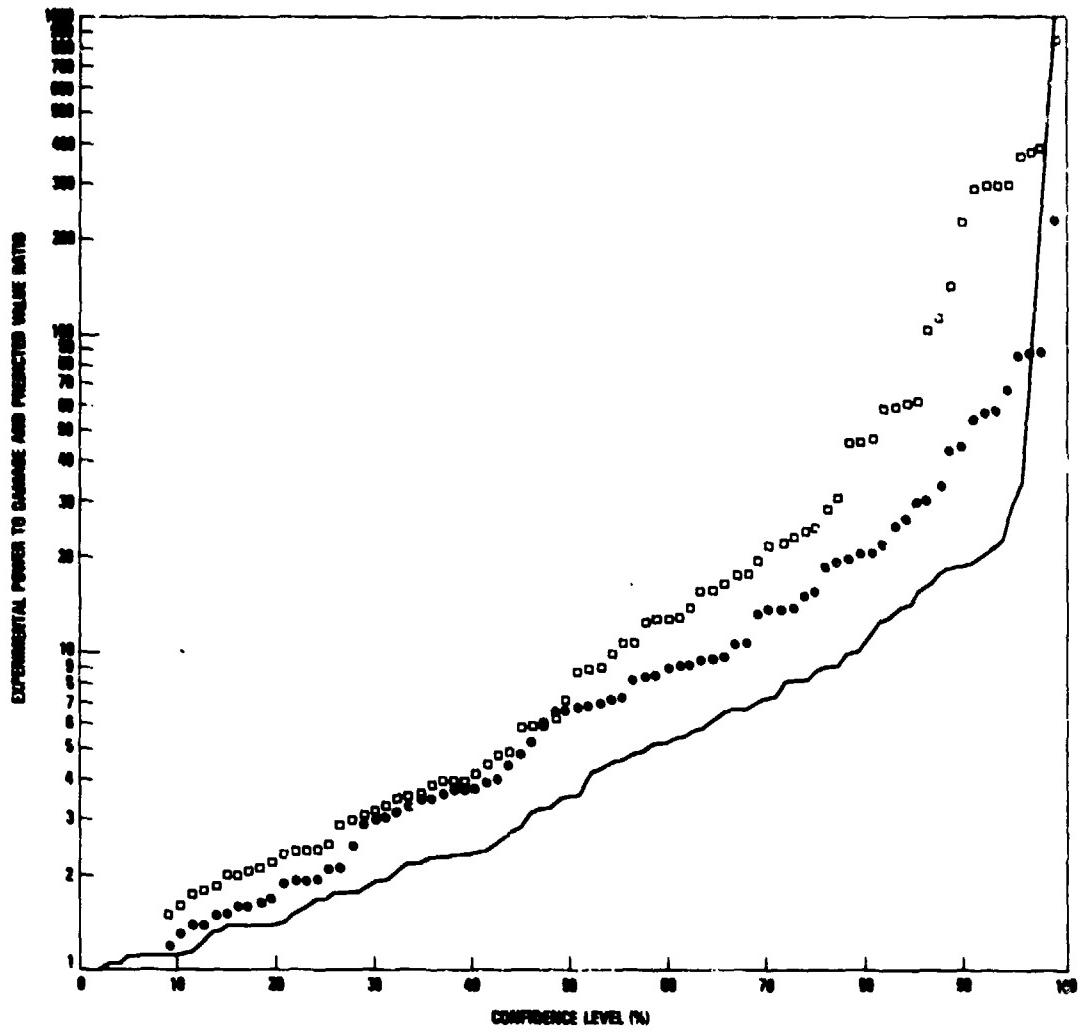


Figure 9. Confidence level for dc power rating model: arithmetic mean used as standard for developing model parameters (solid circles), median values employed (squares), and confidence level for junction capacitance damage model (solid curve).

In the development of this model, the same assumption on the power relation of equation (1) is employed as in the junction capacitance damage model ($N = 0.5$), despite the results of figure 1. In this way, the comparison between models minimizes this factor as a source of error and allows a better comparison between the basic damage models. The model is developed by averaging the experimental powers to damage at the 10- μ s pulse duration for that segment of population A applicable to this

model as previously defined for the high power class and low power class of devices. The average is defined, as previously, as both the arithmetic mean and median values. The Vansch-Bell relationship of equation (1) is used to calculate the effective damage constant for the high and low power devices.

$$K_H = 3.16 \times 10^{-3} P_H \quad (12)$$

and

$$K_L = 3.16 \times 10^{-3} P_L \quad , \quad (13)$$

where K_H and K_L are the damage constants for the high and low power class of devices and P_H and P_L are the corresponding average experimental power to damage at 10 μ s for population A devices. The values for K_H and K_L are given in table 3. Using equations (12) and (13) with the damage constant values of table 3 on population B devices results in the confidence level curves of figure 10 (with the junction capacitance damage model curve included for comparison). There is no appreciable difference in the predictive capability of the junction capacitance damage model and the power class damage model. Included in figure 10 is a fourth curve that represents the scatter in the experimental damage data for all population B devices. This curve is the percentage confidence level that a device selected from among the population B test items has a scatter from the experimentally established damage curves less than or equal to the ordinate value.

TABLE 3. DAMAGE CONSTANTS FOR HIGH AND LOW POWER DEVICES FOR POWER CLASS DAMAGE MODEL

Statistic	Damage constant ($W \cdot s^{1/2}$)	
	High power	Low power
Arithmetic mean	6.1	0.089
Median	2.2	0.063

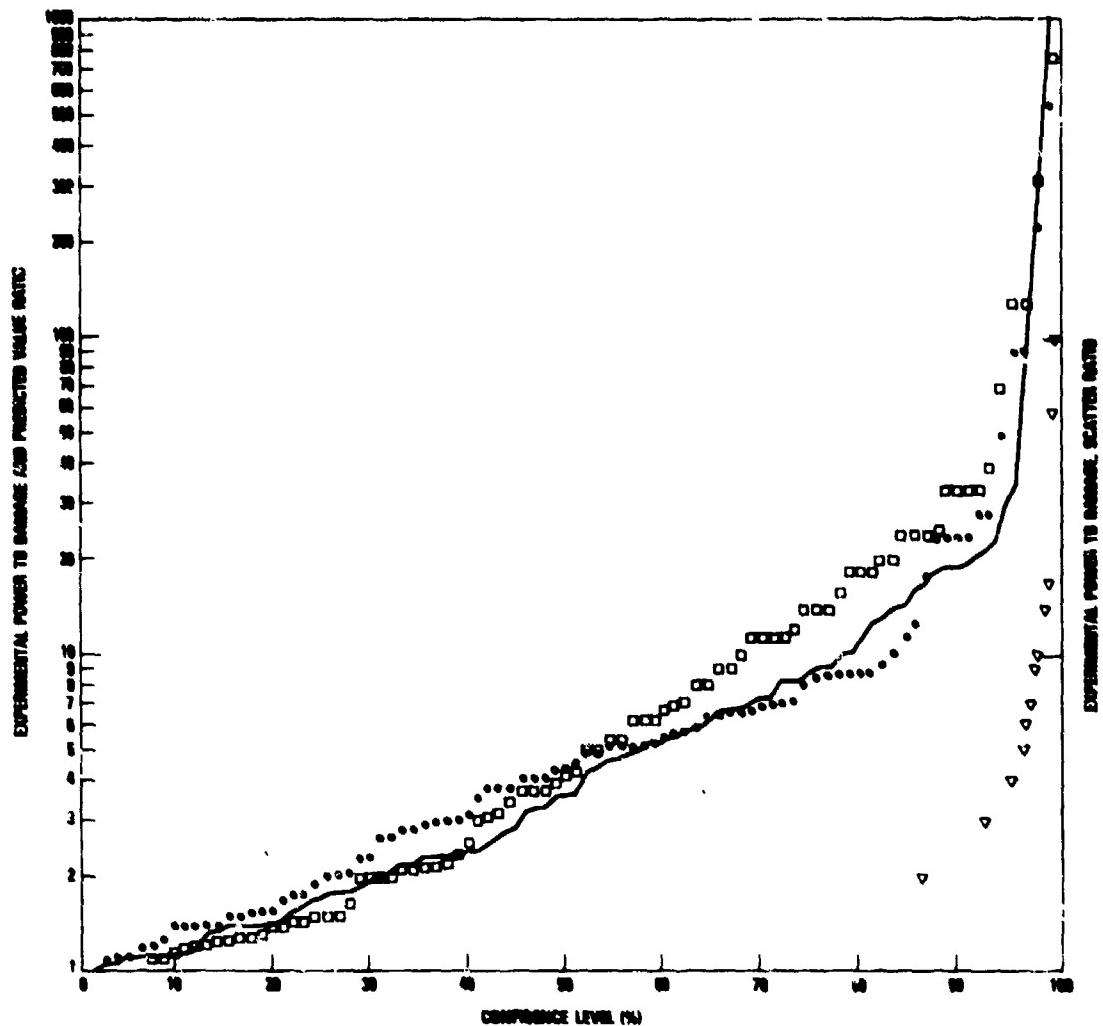


Figure 10. Confidence level for power class damage model: arithmetic mean used as standard for developing model parameters (solid circles), median value employed (squares), confidence level for experimentally established damage curves based on scatter in experimental data (triangles), and junction capacitance damage model confidence level (solid curve).

4. SUMMARY AND FINAL ANALYSIS

Two standards were used to analyze the predictive capability of the junction capacitance damage model. The first was a comparative test based on the development of two alternative, simpler models. Ease of use and general applicability were the criteria for the design of the dc power rating and power class models. These criteria resulted in models

applicable to 88 and 90 percent of the devices of the silicon standard population based on manufacturers' published data compared with 16 percent for the junction capacitance damage model. The dc power rating model was based on the assumption that there exists some measure of correlation between transient level to failure and dc power rating. Since certain classes of devices are rated for forward bias and others are rated for reverse bias, no distinction was made between these conditions for model development.

Despite this nonrigorous mixing of power rating standards, the resultant model provided a level of correlation with the experimental damage data only two to four times poorer than the junction capacitance damage model. The power class model was based on the assumption that all devices (excluding microwave diodes) could be equated to either a high power device with a damage constant of $6.1 \text{ W-s}^{1/2}$ (arithmetic mean) or a low power device with a damage constant of $0.089 \text{ W-s}^{1/2}$ (arithmetic mean). To establish the applicable class for transistors, the manufacturers' catalogings of devices as high or low power were used. Since the dividing line between high and low powers is a rating of 1 W (with some exceptions), the 1-W power rating was used to divide diodes into the applicable classes. The resultant model displayed a level of correlation with the experimental damage data comparable to the level of the junction capacitance damage model. These results do not bode well for the ostensibly more sophisticated junction capacitance damage model.

A second standard to test the predictive capability of the junction capacitance damage model is based on the uncertainty in the failure level of devices resulting from their spread about an experimentally established damage curve. This uncertainty compels the user to place error bars upon the experimental damage data. Also, this uncertainty gives an absolute standard for comparing the junction capacitance damage model. It is standard procedure to define a device failure curve and to bound the lower limit on this curve with a second curve. This lower limit insures a certain measure of confidence that the subject device does not have an actual failure level below the value used. To achieve this same measure of confidence by using predicted failure based on the junction capacitance damage model requires a spread in the low bound approximately one order of magnitude larger than that required of an experimentally determined failure relationship.

In the development of the dc power rating and power class models, some concern must be given to the possibility that the population selected and the standards used produced a fortuitous correlation with the capacitance model. Although the size of the population and the standards used would seem to minimize this possibility, it is a worthwhile exercise to redefine the population and the standards to observe the resultant variation in model predictions. An exhaustive

compendium of such results is given in the appendix. A rigorous comparison among the many predictions is difficult because of the varying standards. Nevertheless, the trend indicates a variation in model predictions, particularly for the power class model, that requires no qualification of the results given in the body of this report.

APPENDIX A.--DAMAGE MODELING COMPUTER CODE

APPENDIX A

Contained within this appendix is a code used to generate many of the data presented in the body of the report and a statistical study of the direct current power rating and power class models based on varying population standards. Included with the code is a single printout of resultant code data. The printout covers only those data for which the arithmetic mean was used for all modeling, and the extrapolated values for experimental power to damage were incorporated into the data base.

Although not indicated in the main body of the report, a study of the performance of the junction capacitance damage model for germanium devices is included. The germanium device model was taken from documentation receiving limited distribution based on a very limited germanium device population. Predictably, the results indicate a much poorer performance of the junction capacitance damage model for the germanium than for the silicon devices.

The nature of the populations and the results for the alternative tests of the proposed models are discernible from the information included in the data output. The quantity of the printed data is indicative of the mass of the data that must be handled in a study of this nature.

APPENDIX A

```

SUBROUTINE SUBFA(B,I,DM511,CMS12,CONST3)
  CONST1=(-3.162*(B-A)*C-B)/(61.54*10.*5.)
  CONST2=(10.-*(B-A)*C+81./676.*C)
  CONST3=B-(17.*C)/CUM511-(10.+93.)*CONST2
  RETURN
END
SUBROUTINE SUBAKA(B,M,KC,PREDCT)
  DIMENSION B(91,3),D(92)
  KV=0
  DO 1 N=KC,KA
    IF(B(N,K).EQ.0.) GO TO 1
    KV=1+KV
    D(M)=ABS(B(N,K))
  1 CONTINUE
  KB=KV/2
  KK=92
  DO 2 M=1,KB
    BG=0.
    DMK=0.
    DMK=0.
    DO 3 K=KC,KA
      IF(D(K)-1.E-3G) GO TO 3
      BG=0.(K)
    KK=K
  3 CONTINUE
  2 CONTINUE
  C=DMKK
  RETURN
END
SUBROUTINE SUBB(MDD,NC,E,AC,ND,PML,PMLR,PMLH)
  DIMENSION A(92,1), PML(91), E(92,1)
  DO 1 N=1,92
    A(M,1)=ABS(E(M,1))
  1 CONTINUE
  NZ=92
  DO 404 M=1,MDD
    BG=0.
    A(NZ,1)=J.
    A(NZ,1)=J.
    DO 405 NC=NC,ND
      IF(PML(N)-ME-1.) GO TO 405
      IF(A(N,1).LE.BG) GC TO 405
      BG=A(N,1)
    NZ=N
  405 CONTINUE
  404 CONTINUE
    PML=A(NZ,1)
    NZ=92
    DO 406 M=1,NC
      BG=0.
      A(NZ,1)=J.
      DO 407 NC=NC,ND
        IF(PML(N)-ME-2.) GO TO 407
        IF(A(N,1).LE.BG) GE TL 4(7)
        BG=A(N,1)
      NZ=N
  407 CONTINUE
    PMLH=A(NZ,1)

```

```

RETURN
END
DIMENSION PHRA(91), PHRB(91), PERCH(300), CM1(6600)
DIMENSION 6(91,3), S(773,251), D(92,1), U(92,1), V(92,01)
DIMENSION SLOPE(91,4), A(92,61), VAL(3,10), C(3,10), DEVICE(400)
DIMENSION TC328A(91), TE328A(91), TC335(91), TE335(91), TC336(91),
LIE336(91), TC2857(91), TE2857(91), TL3375(91), TE3375(91), TC2484(91),
LT224(91), TC3736(91), TE3736(91), TC9304(91), TE9304(91), TC1490(91),
LT1490(91), TC3584(91), TE3584(91), TC5829(91),
LT5829(91), TC3013(91), TE3013(91), TC3018(91), TE3018(91), TC5851(91),
LT5851(91), TC1613(91), TE1613(91), TC2481(91), TE2481(91), TC2901(91),
LIE2901(91), TC2222(91), TE2222(91), TC1485(91), TE1485(91), TC3439(91),
LT3439(91), TC706(91), TE706(91), D1468(91), D2116(91), D752(91),
LT4384(91), DF5911(91), D816(91), D2116(91), D914(91), D752(91),
LTC115(91), D4858(91), D29918(91), D3058(91), D1054(91), D744A(91),
LD3026(91), D3611(91), D3995A(91), D30168(91), D4141(91), D1026(91),
LIE445(91), D12028(91), D173A(91), TC396A(91), TE366A(91), TC420M(91),
LIE428M(91), TC404A(91), TE404A(91), TC1613, TE1613, TC2481, TE2481,
LIE501A(91), TC7054(91), TE7054(91), TC297A(91), TE297A(91), TC466M(91),
LIE466M(91), TC1042(91), TE1042(91), TC526(91), TE526(91), D2776(91),
LIE220(91), D3104(91),
NAMELIST//LISTA/TC328A,TE328A,TC335,TE335,TE336,TE336,TC2857,
LIE2857,TC3375,TE3375,TC2684,TE2684,TC3736,TE3736,TC900,TE930,
LTC1490,TE1490,TC3584,TE3584,TE2894,TE2894,TE529,TE529,TC3013,
LIE3013,TC3018,TE3018,TC35MP,TE35MP,TC1613,TE1613,TC2481,TE2481,
LIE2907,TC2907,TC2222,TE2222,TC1485,TE1485,TC2439,TE3439,TC706,
LIE706,DIE6%,D2580,0751A,04-84,DF591,0816,D21ME,D914A,D752A,
LDCP15,D615,D2991B,D3025B,D1024,D1024,D746A,D3611,D395A,
LDCP2016,D6161,D1002,D645,D1202,D1731A,TC396A,TE396A,TC428M,
LIE428M,TC404A,TE404A,TC393,TE393,TE501A,TC705,TC705,
LIE297A,TE297A,TC466M,TE466M,C1042,E1042,TC526,TE526,D277,D270,
LDS140,DEVICE,SWITCH,PARA,PWRB,PREDCT
READ(5,LISTA)
DO 1 N=1,6
  1
C 51 DEVICES
  A11,N)=TC328A(N)
  A12,N)=TE328A(N)
  A13,N)=TC335(N)
  A14,N)=TE335(N)
  A15,N)=TC336(N)
  A16,N)=TE336(N)
  A17,N)=TC2484(N)
  A18,N)=TE2222(N)
  A19,N)=D4304(N)
  A20,N)=DF5911(N)
  A10,N)=TE3136(N)
  A11,N)=TC280(N)
  A12,N)=TE9304(N)
  A13,N)=TC2681(N)
  A14,N)=TE2894(N)
  A15,N)=TE2807(N)
  A16,N)=TE2971(N)
  A17,N)=TC2222(N)
  A18,N)=TE2222(N)
  A19,N)=D4304(N)
  A20,N)=DF5911(N)
  A121,N)=D816(N)
  A122,N)=D21ME(N)
  A123,N)=D914A(N)
  A124,N)=D752A(N)
  A125,N)=D914A(N)
  A126,N)=D21ME(N)

```

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C 51 145 DEVICES

A126 • N1 = D30268 (N1)	A127 • N1 = D3611 (N1)
A128 • N1 = D3954 (N1)	A129 • N1 = D36168 (N1)
A130 • N1 = D4161 (N1)	A131 • N1 = D1002 (N1)
A132 • N1 = TC2657 (N1)	
A133 • N1 = TE2657 (N1)	
A134 • N1 = TC3564 (N1)	
A135 • N1 = TE3975 (N1)	
A136 • N1 = TC1490 (N1)	
A137 • N1 = TE1690 (N1)	
A138 • N1 = TC3564 (N1)	
A139 • N1 = TE3564 (N1)	
A140 • N1 = TE3975 (N1)	
A141 • N1 = TE2094 (N1)	
A142 • N1 = TC5829 (N1)	
A143 • N1 = TE5829 (N1)	
A144 • N1 = TC3013 (N1)	
A145 • N1 = TE3013 (N1)	
A146 • N1 = TC3018 (N1)	
A147 • N1 = TE3018 (N1)	
A148 • N1 = TC5M05 (N1)	
A149 • N1 = TE5M05 (N1)	
A150 • N1 = TC1613 (N1)	
A151 • N1 = TE1613 (N1)	
A152 • N1 = TC1605 (N1)	
A153 • N1 = TE1605 (N1)	
A154 • N1 = TC3639 (N1)	
A155 • N1 = TE3439 (N1)	
A156 • N1 = TC706 (N1)	
A157 • N1 = TE706 (N1)	
A158 • N1 = D18696 (N1)	
A159 • N1 = D2580 (N1)	
A160 • N1 = D7514 (N1)	
A161 • N1 = D4856 (N1)	
A162 • N1 = D29918 (N1)	
A163 • N1 = D30252 (N1)	
A164 • N1 = D10544 (N1)	
A165 • N1 = D7464 (N1)	
A166 • N1 = D6454 (N1)	
A167 • N1 = D1222 (N1)	
A168 • N1 = D1731 (N1)	

C GE DEVICES

A69 • N1 = TC4044 (N1)
A670 • N1 = TE4044 (N1)
A671 • N1 = TC297A (N1)
A672 • N1 = TE297A (N1)
A673 • N1 = TC526 (N1)
A674 • N1 = TE526 (N1)
A675 • N1 = D220 (N1)

C GE 145 DEVICES

A76 • N1 = TC3964 (N1)
A77 • N1 = TE3964 (N1)
A78 • N1 = TC428M (N1)
A79 • N1 = TE428M (N1)
A80 • N1 = TC393 (N1)
A81 • N1 = TE393 (N1)
A82 • N1 = TC501A (N1)

```

A103-N)=TE501AIN)
A104-N)=TC051IN)
A105-N)=TE7051IN)
A106-N)=TC466HIN)
A107-N)=TE466HIN)
A108-N)=TC3042IN)
A109-N)=TE042IN)
A110-N)=D2776IN)
A111-N)=DS1247IN)

1 CONTINUE
C AIN.1=EXPERIMENTAL POWER TO DAMAGE AT 10 MICROSECONDS (WATTS)
C AIN.2=EXPERIMENTAL POWER TO DAMAGE AT 1 MICROSECOND (WATTS)
C AIN.3=EXPERIMENTAL POWER TO DAMAGE AT 0.1 MICROSECOND (WATTS)
C AIN.4=CAPACITANCE MODEL DAMAGE CONSTANT (W-51/2) 0-A-T-A. PUNK PARM.
C AIN.5=CAPACITANCE MODEL DAMAGE CONSTANT EXPERIMENTAL PARAMETERS
C AIN.6=MANUFACTURERS DC POWER RATING
DD 200 N=1.91
IF(AIN.31-.NE.0.) GO TD 200
IF(AIN.11-.NE.0.) GO TD 204
IF(AIN.51-.EQ.0.) GO TD 201
DAM1(AIN.51
GO TO 203
201 IF(AIN.41-.EQ.0.) GO TD 202
DAMK=.6IN.41
GO TO 203
202 IF(AIN.61-.EQ.0.) GO TD 201
AIN.31=-VAL1(1.2)*AIN(.6)*10.-.97-VAL(2.2)*AIN(.6)*3162.-
(-VAL(3.2)*AIN.6)
AIN.21=-VAL(1.2)*AIN(.6)*10.-.99-VAL(2.2)*AIN(.6)*1000.
C-VAL(3.2)*AIN.6
AIN.11=-VAL1(2)*AIN(.6)*10.-.95-VAL(2.2)*AIN(.6)*316.2
C-VAL(3.2)*AIN.6
GO TD 200
203 AIN.31=-DAMK*3162.
AIN.21=-DAMK*1000.
AIN.11=-DAMK*316.2
GO TD 200
204 AIN.31=-10.*AIN.11
AIN.21=-3.*AIN.11
200 CONTINUE
DD 206 N=1.91
IF(AIN.21-.LE.0.) GO TD 221
SLOPEIN.21=-ALOG10AIN.11/AIN.21
GO TD 222
221 SLOPEIN.21=-1.
222 IF(AIN.31-.LE.0.) GO TD 223
SLOPEIN.21=-ALOG10AIN.21/AIN.31
GO TD 224
223 SLOPEIN.21=-1.
224 IF(AIN.31-.LE.0.) GO TD 225
SLOPEIN.31=-ALOG10AIN.11/AIN.31)/2.
GO TD 206
225 SLOPEIN.31=-1.
206 CONTINUE
C SLOPE CONTAINS THE POWER FUNCTION FOR THE TIME DEPENDENCY OF POWER TO DAM.
909 FORMAT(2X,1111111111)
WRITE6,*0.0001
802 FORMAT(2X,1024RATIO OF EXPERIMENTAL POWER TO DAMAGE TO DC POWER NO
     MODEL PREDICTED VALUE FOR FOLLOWING MODEL DATA BASE: //1
     WRITE6,*0.09)

```

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609 FORMAT(1X,.14H,.ALL DEVICES/.4X,.22H).-ALL SILICON DEVICES/
  L6X,2MC--ALL GERMANIUM DEVICES/
  L6X,4SH--ALL DEVICES WITHOUT CAPACITANCE MODEL DATA/
  L6X,53H--ALL SILICON DEVICES WITHOUT CAPACITANCE MODEL DATA/
  L6X,55HF--ALL GERMANIUM DEVICES WITHOUT CAPACITANCE MODEL DATA/
  L6X,53H--ALL SILICON DEVICES NOT INCLUDED WITHIN 145 REPORT/
  L6X,55H--ALL GERMANIUM DEVICES NOT INCLUDED WITHIN 145 REPORT/
  L6X,6SH--ALL SILICON DEVICES INCLUDED WITHIN 145 REPORT/
  L6X,51M--ALL GERMANIUM DEVICES INCLUDED WITHIN 145 REPORT//]

WRITE6,810

610 FORMAT(12X,12O)FOR ALL CASES WHERE DATA BASE PERMITS, RATIOS ARE ON
  ELY FOR THF REMAINING SILICON OR GE DEVICES NOT INCLUDED IN DATA BA
  SES//]

WRITE6,951
  FORMAT(12X,.97H)(-J ENTRY INDICATES NO DATA OR NO CALCULATION
  FOR ITEM K, -1 INDICATES NO CALCULATION//)
  WRITE6,254)
254 FORMAT(12X,10H)JUNCTION REVERSE BIAS CONDITIONS ONLY NEGATIVE SJ
  LCN INDICATES ESTIMATED VALUES FOR POWER TO DAMAGE//)
  IF(5WCH,5U,0.) GO TO 46
  WRITE6,47)
47 FORMAT(12X,42W)MEDIAN VALUE USED FOR ALL MODEL DATA BASES//)
  GO TO 48
48 WRITE6,49)
49 FORMAT(12X,45W)ARITHMETIC MEAN USED FOR ALL MODEL DATA BASES//)
46 CONTINUE
  IF(4PREDCT,NE,0.) GO TO 50
  WRITE6,51)
51 FORMAT(12X,81W)ALL PREDICTED VALUES FOR EXP. POWER TO DAMAGE REMOVED
  LD IN DATA BASE CALCULATIONS//)
52 CONTINUE
  WRITE6,53)
53 FORMAT(12X,80W)ALL PREDICTED VALUES FOR EXP. POWER TO DAMAGE INCLUDE
  LD IN DATA BASE CALCULATIONS//)
52 CONTINUE
  WRITE6,909)
  WRITE6,253)
253 FORMAT(125X,.14H EXP. POWER .14H EXP. POWER .14H EXP. POWER
  L14H DAM. CONST. .14H DAM. CONST. .14H DC POWER .14H POWER
  ECLASS)
  WRITE6,27C)
270 FORMAT(125X,.14H TO DAMAGE .14H TO DAMAGE .14H TO DAMAGE
  L14H DATA BOOK .14H EXPERIMENTAL .14H RATING .14H HI
  LCH=2)
  WRITE6,271)
271 FORMAT(125X,.14H AT ICUS .14H AT IUS .14H AT 0.1US .
  L14H PARAMETERS .14H PARAMETERS .14H,14H LOW=1)
  WRITE6,272)
272 FORMAT(125X,.14H (WATTS) .14H (WATTS) .14H (WATTS)
  L14H (WATTS) .14H (WATTS) .14H (WATTS) .14H EXCLUD
  LED=0)
  WRITE6,722)
722 FORMAT(12X,15H)SILICON DEVICES)
  DO 209 N=1,91
  IF(N,NE,49) GO TO 723
  WRITE6,724)
724 FORMAT(12X)
  WRITE6,725)
725 FORMAT(12X,17HGERMANIUM DEVICE)
  723 CONTINUE

```

APPENDIX A

```

KA=4+H-1,I+1
KB=4+H-1,I+2
KC=4+H-1,I+3
KD=4+H-1,I+4
WD=4+H-1,I+5

WRITE(6,208)DEVICE(KA),DEVICE(WD),DEVICE(WC),DEVICE(WD),DEVICE(WC)
FORMAT(6,4A4,3F14.3,F14.6,FI0.0)
CONTINUE
208
DO 413 M=1,92
  U6W,I1=A(W,I1)
CONTINUE
413
DJ 620 M=1,3
  DO 621 M=1,91
    IF(A(IH,I1)-EQ.0.) GO TO 621
    IF(A(IH,M1)-EQ.0.) GO TO 621
    IF(PREDCT.ME.=0.) GO TO 90
    IF(A(MH,M1)-GE.0.) GO TO 621
    ASW,RI=0.
    GO TO 621
  CONTINUE
90
  BCA,M1=ACHN,M1/A(W,I1)
CONTINUE
621
CONTINUE
623
  WRITE(6,214)
  FORMAT(2X,63HFORMAT OF EXPERIMENTAL POWER TO DAMAGE TO DEVICE DC PU
        LMER RATING//)
  WRITE(6,623)
  FORMAT(2Z22.21M 10 USEC ,11M 1 USEC ,11M 0.1 USEC //)
33
  DO 624 M=1,91
    KA=4+H-1,I+1
    KB=4+H-1,I+2
    KC=4+H-1,I+3
    KD=4+H-1,I+4
    WRITE(6,625)DEVICE(KA),DEVICE(WD),DEVICE(WC),DEVICE(WD),DEVICE(WC)
    C1B1N,M1,M=1,31
    FORMAT(6,4A4,2F11.1)
    CONTINUE
624
    DO 3 M=1,3
      IF(SWICH,FE,0.) GO TO 310
      KA=91
      KC=1
      CALL SUBACKA,B,W,C(W,I1,KC,PREDCT)
      GO TO 3
310
    DO 2 M=1,91
      IF(A(MH,I1)-EQ.0.) GO TO 2
      IF(A(IH,M1)-EQ.0.) GO TO 2
      A6W,M1=OSIAIN(M1)
      C1W,I1=ACHN,M1/A(W,I1)
      PT=1,OPT
    CONTINUE
2
    C1W,I1=C(W,I1)/PT
    PT=0.
  CONTINUE
3
  CALL SUBC(H,I1,C(12,1),C(13,1),VAL(1,1),VAL(12,1),VAL(13,1))
  DO 22 M=1,3
    DO 23 M=1,91
      IF(A(MH,M1)-EQ.0.) GO TO 23
      IF(A(IH,M1)-EQ.0.) GO TO 23

```

APPENDIX A

```

NN=NN+46
ALN,NN1=A1NN,NN1/(CIN,NN1,NC1(N,NN1))
23 CONTINUE
22 CONTINUE
C VAL(1,1)-12,11-13,11) ARE THE CONSTANTS FOR THE EXPRESSIONS
C P1=VAL(1,1)-11*NC2+101-5)*NC3 FOR ALL DEVICES
PTQ,
00 6 NN1,3
IF(SWITCH.EQ.0.) GO TO 311
NN=NN
NC=1
CALL SUBAIN,B,N,CIN,2),KC,PREDCT)
GO TO 4
311 DO 5 N=1,48
IF(A1NN,NN1-EQ.0.) GO TO 5
IF(A1NN,NN1-EQ.0.) GO TO 5
A1NN,NN1=A1NN,NN1
CIN,2)=A1NN,NN1/A1NN,NN1+CIN,2)
PT=1,OPT
5 CONTINUE
CIN,2)=CIN,NN2/P1
PT=0,
6 CONTINUE
00 24 N=1,3
00 25 N=1,68
IF(A1NN,NN1-EQ.0.) GO TO 25
IF(A1NN,NN1-EQ.0.) GO TO 25
NN=NN
A1NN,NN1=A1NN,NN1/(CIN,NN1+A1NN,NN1)
25 CONTINUE
24 CONTINUE
CALL SUB(C11,2),C12,2),C13,2),VAL11,2),VAL12,2),VAL13,2))
C VAL(1,2)-12,2)-13,2) ARE CONSTANTS FOR ALL SILICON DEVICES
PTQ,
00 6 NN1,3
IF(SWITCH.EQ.0.) GO TO 312
NN=NN
NC=93
CALL SUBAIN,B,N,CIN,3),KC,PREDCT)
GO TO 6
312 DO 7 N=69,91
IF(A1NN,NN1-EQ.0.) GO TO 7
IF(A1NN,NN1-EQ.0.) GO TO 7
A1NN,NN1=A1NN,NN1
CIN,3)=A1NN,NN1/A1NN,NN1+CIN,3)
PT=1,OPT
7 CONTINUE
CIN,3)=CIN,NN3/P1
PT=0,
8 CONTINUE
CALL SUB(C11,3),C12,3),C13,3),VAL11,3),VAL12,3),VAL13,3))
C VAL(1,3)-12,3)-13,3) ARE CONSTANTS FOR ALL GERMANIUM DEVICES
DO 26 N=1,3
00 27 N=69,91
IF(A1NN,NN1-EQ.0.) GO TO 27
IF(A1NN,NN1-EQ.0.) GO TO 27
NN=NN
A1NN,NN1=A1NN,NN1/(CIN,NN1+A1NN,NN1)
27 CONTINUE
CONTINUE
28

```

APPENDIX A

```

PT=0.
DO 8 N=1,3
  IF ISNTCH.EQ.0.1 GO TO 313
  N=0
  DO 314 N=1,91
    IF ((N=47).EQ.0.) GO TO 314
    IF ((N,M)=EQ.0.) GO TO 314
    IF ((N=4).NE.0.) GO TO 314
    IF ((N=5).NE.0.) GO TO 314
    N=N+1
    IF (P>0.001.EC.0.1) GO TO 60
    IF (P<0.001.EC.0.1) GO TO 60
    IF (P>0.1.EC.0.1) GO TO 60
    IF (P<0.1.EC.0.1) GO TO 60
    CONTINUE
    P=ABS(100.*M))
  60
CONTINUE
314
CONTINUE
N=N+10/2
M=M/2
DO 315 N=1,4000
  86-Q;
  D10=(0)
  DO 316 N=1,91
    IF ((N,6).EQ.0.) GO TO 316
    IF ((N,M)=EQ.0.) GO TO 316
    IF ((N,4)=EQ.0.) GO TO 316
    IF ((N=5).NE.0.) GO TO 316
    IF ((N=51).LE.26,) GO TO 316
    IF ((N).LT.26,) GO TO 316
    BE=0.1N)
    KK=4
    CONTINUE
    CONTINUE
    C(M,4)=DIRK)
  315
CONTINUE
C(M,4)=C(M,4)/PT
  60 TD 6
CONTINUE
  813
  DO 9 N=1,91
    IF ((N,M)=EQ.0.) GO TO 9
    IF ((N,M)=EQ.0.) GO TO 9
    IF ((N=4).NE.0.) GO TO 9
    IF ((N=51).NE.0.) GO TO 9
    A(M,N)=ABSI(A(N,M))
    C(M,4)=A(M,4)/A(N,M)*C(M,4)
    PT=1./PT
    CONTINUE
    C(M,4)=C(M,4)/PT
  PT=0.
    CONTINUE
  CALL SUB((C(1,4),C(2,4),C(3,4),VAL1,4),VAL2,4),VAL(3,4))
  8
  C VAL1,4)-(2,-4,3,4) ARE CONSTANTS FOR ALL DEVICES WITHOUT CAPACITANCE MODEL
  C DATA
  9
  DO 28 N=1,3
    DO 29 N=1,91
      IF ((N,M)=EQ.0.) GO TO 29
      M=M+0.5
      A(M,M)=A(M,M)/(C(M,4)*A(M,4))
  29
    CONTINUE
  28
    DO 10 N=1,3
      IF ISNTCH.EQ.0.) GO TO 10 317
      M=0

```

APPENDIX A

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DO 318 N=1,48
1FIA(N,6).EQ.0.1 GO TO 318
1FIA(N,4).EQ.0.1 GO TO 316
1FIA(N,6).NE.0.1 GO TO 310
1FIA(N,5).NE.0.1 GO TO 310
NN=1.0NN
IF (PRED1.NE.0.1 GO TO 61
1FIB(N,M).LT.0.1 B(M,N)=0.
CONTINUE
61 DINI=AABS((N,M))
318 CONTINUE
NN=N/2
KK=92
DO 319 K=1,NN
B6=U-
DINKJ=0.
DO 320 N=1,48
1FIA(N,6).EQ.0.1 GO TO 320
1FIA(N,M).EQ.0.1 GO TO 320
1FIA(N,4).NE.0.1 GO TO 320
1FIA(N,5).NE.0.1 GO TO 320
1FIA(N,1).LE.4C1 GO TO 320
B6=D(N)
KK=N
320 CONTINUE
319 CONTINUE
C(M,S)=D(KK)
50 TO 10
317 DO 11 K=1,68
1FIA(N,6).EQ.0.1 GO TO 11
1FIB(N,M).EQ.0.1 GO TO 11
1FIA(N,4).NE.0.1 GO TO 11
1FIA(N,5).NE.0.1 GO TO 11
1FIA(N,1).LE.4C1 GO TO 11
A1M,A1B=(N,M)
C(M,S)=A1M,M1=A1N,M1=C(M,5)
PT=1.0P
11 CONTINUE
C(M,S)=C(M,S)/PT
PT=0.
318 CONTINUE
CALL SUB(C(1,5),C(2,5),C(3,5),VAL11,S1,VAL12,S1,VAL13,S1)
C VAL(1,5)-(2,5)-(3,5) ARE CONSTANTS FOR SI DEVICES WITHOUT CAP. MODEL DATA
C 00 31 M=1,3
00 32 N=1,68
1FIA(N,M).EQ.0.1 GO TO 32
1FIA(N,6).EQ.0.1 GO TO 32
1FIA(N,4).NE.0.1 GO TO 33
1FIA(N,5).EQ.0.1 GO TO 32
1FIA(N,1).NE.0.1 GO TO 32
33 NN=M+18
A(M,N)=A1M,M1=(C(M,S)+0.001)
32 CONTINUE
31 CONTINUE
30 12 N=1,3
1FISWTC(EQ,0.1 GO TO 321
NN=0
DO 322 N=69,91
1FIA(N,6).EQ.0.1 GO TO 322
1FIA(N,M).EQ.0.1 GO TO 322
1FIA(N,4).NE.0.1 GO TO 322
1FIA(N,5).NE.0.1 GO TO 322

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APPENDIX A

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NN+1+NN
  IF(PREDICT,NE,0.,) GO TO 62
  IF(I0(N,M),LT,0.,) BN(N,M),=0.
62  CONTINUE
  D111=ABS(BN,M)
322  CONTINUE
  ABS=NN/2
  K1=92
  DO 323 K=1,NNN
  BG=0.
  DCK1=0.
  DO 324 K=69,91
  IF(A(N,61)=EQ,0.,) GO TO 324
  IF(A(N,M)-EQ,0.,) GO TO 324
  IF(A(N,4)-EQ,0.,) GO TO 324
  IF(A(N,5)-EQ,0.,) GO TO 324
  IF(A(N,6)-EQ,0.,) GO TO 324
  IF(A(N,7)-EQ,0.,) GO TO 324
  IF(D(N),LE,ABC) GO TO 324
  BG=0.(M)
323  CONTINUE
324  CONTINUE
325  CONTINUE
  COM,6)*D(CK1)
  60 T0 32
321  DO 13 K=69,91
  IF(A(N,61)=EQ,0.,) GO TO 13
  IF(GA(N,M)-EQ,0.,) GO TO 13
  IF(A(N,4)-EQ,0.,) GO TO 13
  IF(A(N,5)-EQ,0.,) GO TO 13
  IF(A(N,6)-EQ,0.,) GO TO 13
  IF(A(N,7)-EQ,0.,) GO TO 13
  ATN,M)=ABS(A(N,M))
  CIN,6)=A(N,M)/ATN,6)+CIN,6)
  PT=1,OPT
13  CONTINUE
  CIN,6)=CIN,6)/PT
  PT=0.
12  CONTINUE
  CALL SUB(C11,6),C62,6),C13,6),VAL(1,6),VAL(2,6),VAL(3,6)
  VAL(1,6)=12,6)-(3,6) ABS CONSTANTS FOR CF DEVICES WITHOUT CAP. MODEL DATA
  DD 34 M=1,3
  DO 35 M=69,91
  IF(A(N,M)-EQ,0.,) GO TO 35
  IF(A(N,6)-EQ,0.,) GO TO 35
  IF(A(N,5)-EQ,0.,) GO TO 35
  IF(A(N,7)-EQ,0.,) GO TO 35
  3M=M+21
  ATN,M)=A(N,M)/(CIN,6)+ATN,6)
35  CONTINUE
36  CONTINUE
34  CONTINUE
  DO 14 M=1,3
  IF(SWITCH,EQ,0.,) GO TO 325
  KA=31
  KC=1
  CALL SUR(A(KA,6,M,C(M,7),KC,SWITCH)
  GO TO 14
  DO 15 M=1,31
  IF(A(N,6)-EQ,0.,) GO TO 15
  IF(A(N,6)-EQ,0.,) GO TO 15
  ATN,M)=ABS(A(N,M))
  C(K,7)=A(N,M)/ATN,6)+C(K,7)
  PT=1,OPT
15  CONTINUE

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APPENDIX A

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C(M,7)=C(M,7)/PT
PT=0.

14    CONTINUE
      CALL SUB(C(1,7),C(12,7),C(13,7),VAL(3,7),VAL(12,7),VAL(13,7))
      C   VAL(1,1)-(2,7)-(3,7) ARE CONSTANTS FOR SI DEVICES NOT IN 145 REPORT
      DD 37 M=1,3
      DD 38 M=32,68
      IF(AIN,M1-EQ,0.) GO TU 38
      IF(AIN,M1-EQ,0.) GO TU 38
      MM=M+24
      AIN,M1-AIN,M1)/(C(M,7)+A(M,6,1))
      38    CONTINUE
      DO 17 M=1,3
      1F (SWITCH-EQ,0.) GO TU 326
      16    CONTINUE
      KC=75
      KC=69
      CALL SUBAIKA,B,M,C(M,6),KC,SWICH)
      DO 17
      TC 17
      DD 16 M=69,75
      IF(AIN,M1-EQ,0.) GO TU 16
      IF(AIN,M1-EQ,0.) GO TU 16
      AIN,M1-ABS(AIN,M1)
      C(M,6)=AIN,M1/AIN,M1+C(M,6)
      PT=1-PT
      16    CONTINUE
      C(M,6)=C(M,6)/PT
      PT=0.

17    CONTINUE
      CALL SUB(CC(1,8),CC(2,8),CC(3,8),VAL(1,8),VAL(2,8),VAL(3,8))
      C   VAL(1,8)-(2,8)-(3,8) ARE CONSTANTS FOR GE DEVICES NOT IN 145 REPORT
      DD 39 P=1,3
      DO 40 S=76,91
      IF(AIN,M1-EQ,0.) GO TU 40
      IF(AIN,M1-EQ,0.) GO TU 40
      M=M+27
      AIN,M1-AIN,M1/CC(M,8)+A(M,6,1)
      40    CONTINUE
      39    CONTINUE
      DO 18 M=1,3
      1F (SWITCH-EQ,0.) GO TU 327
      KA=68
      KC=32
      CALL SUBA(KA,B,M,C(M,9),KC,SWICH)
      DO 19
      TD 18
      327  90,19 6-32,68
      IF(A(M,6)-EQ,0.) GO TU 19
      IF(AIN,M1-EQ,0.) GO TU 19
      AIN,M1-495TA(M,6,1)
      C(M,9)=AIN,M1/AIN,M1+C(M,9)
      PT=1-PT
      19    CONTINUE
      C(M,9)=C(M,9)/PT
      PT=0.

18    CONTINUE
      CALL SUB(CC(1,9),CC(2,9),CC(3,9),VAL(1,9),VAL(2,9),VAL(3,9))
      C   VAL(1,9)-(2,9)-(3,9) ARE CONSTANTS FOR SI DEVICES INCLUDED IN 145 REPORT
      DD 41 M=1,3
      DD 42 M=1,3
      IF(AIN,M1-EQ,0.) GO TU 42

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APPENDIX A

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IF(AIN,01,EQ,0.,1) GO TO 42
MM=M+30
AIN(MI)=AIN(MI)/CC(M,9)*A(M,6,1)
CONTINUE
41
DO 20 M=1,3
IF(SWITCH-EQ,0,-1) GO TO 328
KA=91
KC=76
CALL SUPAKA,B,M,CIN,M,103,KC,SWITCH)
20
DO 21 M=76,91
IF(AIN,6,-EQ,0,-1) GO TO 21
IF(AIN,M1-EQ,0,-1) GO TO 21
AIN,M1=ASIA(M,M1)
CIN,103=AIN,M1/AIR,6)+CIN,101
PT=1,-OPT
21
CONTINUE
CIN,103=C(M,101)/PT
PT=0.
20
CONTINUE
CALL SUPAC(1,10),C(2,10),C(3,10),VAL(1,10),VAL(2,10),VAL(3,10),
C VAL(1,10)-C(2,10)-(3,10) ARE CONSTRAINTS FOR OF DEVICES INCLUDED IN 145 REPORT
C
42
CONTINUE
DO 43 M=1,3
DO 44 N=69,75
IF(AIN,N1-EQ,0,-1) GO TO 44
IF(AIN,M1-EQ,0,-1) GO TO 44
MM=M+33
AIN,M1=AIN(M,M1)/CC(M,103)*A(M,6,1)
43
CONTINUE
44
CONTINUE
45
CONTINUE
DO 337 M=1,3
DO 338 N=1,9
AIN,M1=ASCA(M,M1)
338
CONTINUE
337
CONTINUE
DO 500 M=1,3
CS=100,*3.162*0M
OU 501 M=1,91
MM=M+3C
IF(AIN,6,-EQ,0,-1) GO TO 501
IF(AIN,M1-EQ,0,-1) GO TO 501
AIN,M1=AIN(M,M1)/AIN,4)*CS)
501
CONTINUE
500
CONTINUE
DO 502 M=1,3
CS=100,*3.162*0M
OU 503 M=1,91
MM=M+39
IF(AIN,6,-EQ,0,-1) GO TU 503
AIN,M1=AIN(M,M1)/AIN,5)*CS)
503
CONTINUE
502
CONTINUE
DO 511 M=1,3
CS=100,*3.162*0M
OU 512 M=1,91
MM=M+42
IF(AIN,5,-EQ,0,-1) GO TU 513
IF(AIN,M1-EQ,0,-1) GO TU 512

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APPENDIX A

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      WRITE(6,214)
      WRITE(6,888)
      888 FORMAT(12X,04HW VALUE FOR RELATIONSHIP: K=P0+L-N) DERIVED FROM E
      EXPERIMENTAL DAMAGE DATA FOR TIME INTERVALS INDICATED//1
      WRITE(6,330)
      330 FORMAT(122X,11H          K          *11H          K          *11H          K          )
      WRITE(6,911)
      911 FORMAT(122X,11H 10-1 USEC ,11H 1-.1 USEC ,11H 10--.1 USEC//1
      DO 250 N=1,91
      K=4*N-11-91
      KB=4*(N-1)-92
      KC=4*(N-1)-93
      KD=4*(N-1)-94
      WRITE(6,251)DEVICE(KA),DEVICE(KB),DEVICE(KC),DEVICE(KD),
      E(SLOPEIN,M1,M=1,3)
      251 FORMAT(16X,4A4,3F11.5)
      CONTINUE
      250 FORMAT(6,214)
      IF(SWITCH.EQ.0.) GO TO 415
      WRITE(6,416)
      416 FORMAT(12X,*3HMEAN VALUES FOR QUANTITIES A THROUGH J FOR PULSE DU
      CATIONS OF 10., 1, AND 0.1 USEC//1
      GO TO 417
      415 WRITE(6,418)
      418 FORMAT(12X,*9HARITHMETIC MEAN VALUES FOR QUANTITIES A THROUGH J FOR
      E. PULSE DURATIONS OF 10., 1, AND 0.1 USEC//1
      417 CONTINUE
      WRITE(6,1121)C(M,11,M=1,3)
      WRITE(6,1121)C(M,2,M=1,3)
      WRITE(6,1121)C(M,31,M=1,3)
      WRITE(6,1121)C(M,41,M=1,3)
      WRITE(6,1121)C(M,51,M=1,3)
      WRITE(6,1121)C(M,61,M=1,3)
      WRITE(6,1121)C(M,71,M=1,3)
      WRITE(6,1121)C(M,81,M=1,3)
      WRITE(6,1121)C(M,91,M=1,3)
      1121 FORMAT(10X,3E12.2)
      WRITE(6,1121)C(M,101,M=1,3)
      WRITE(6,306)
      WRITE(6,551)
      551 FORMAT(120X,76HPOWER TO DAMAGE EQUATION COEFFICIENTS FOR POPULATION
      ES DEFINED BY A THROUGH J//)
      WRITE(6,552)
      552 FORMAT(145X,'1H           -1           -1/2)
      WRITE(6,553)
      553 FORMAT(165X,26HP = K1 T   * K2 T   + K3//)
      WRITE(6,554)
      554 FORMAT(110X,36H    K1       K2       K3       //)
      DO 556 N=1,10
      WRITE(6,557)VAL(1,N),VAL(2,N),VAL(3,N)
      557 FORMAT(10X,2E12.3)
      556 CONTINUE
      WRITE(6,214)
      WRITE(6,504)
      WRITE(6,509)
      504 FORMAT(12X,124HRAVIER OF EXPERIMENTAL POWER TO DAMAGE TO PREDICTED V
      LUE BASED ON JUNCTION CAPACITANCE MODEL: L-MODEL BASED ON O.A.T.A
      E. F7OK]
      509 FORMAT(12X,124HPARAMETERS M-MODEL BASED ON EXPERIMENTAL PARAMETE

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APPENDIX A

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ERS N=MODEL BASED ON EXPERIMENTAL PARAMETERS AND, WHERE DATA WAS
LSING J

517 FORMAT(2X,3HBASED ON D.A.J.A. BOOK PARAMETERS)
      WRITE(6,505)
      WRITE(6,505)
      505 FORMAT(22X,1H      L     , 11H      L     , 11H      L     , 11H      L
      L     , 11H      W     , 11H      W     , 11H      N     , 11H      N
      L11H      N     //)
      WR1E16,506)
      506 FORMAT(22X,1H      10    USEC   , 11H      1    USEC   , 11H      0-1  USEC
      LEC   , 11H      1    USEC   , 11H      0-1  USEC   , 11H      10  US
      E11H      0-1  USEC   //)
      00 507 N=1,91
      KAR=6IN-1) 91
      KB=4QU-1) 92
      AC=6QRK-1) 93
      KD=4QN-1) 94
      NWRITE(6,508 DEVICE(MAN),DEVICE(MK),DEVICE(MC),DEVICE(MD),
      CIAIN,M1,M=37,45)
      508 FORMAT(6X,44,9F11.5)
      507 CONTINUE
      00 410 N49,91
      00 411 R=37,45
      ATN,M)=0.
      411 CONTINUE
      410 CONTINUE
      00 375 KJ=1,2
      IF(IKJ.EQ.1) GO TO 378
      00 379 NZ=1,91
      PMRBNZ1=PMRBNNZ1
      379 CONTINUE
      00 TO 380
      00 381 NZ=1,91
      PMRBNZ1=PMRBNNZ1
      380 CONTINUE
      00 381 NZ=1,91
      IF(IKJ.EQ.1) GO TO 376
      ND=1,8
      376 ND=0
      377 DO 380 KK=1,3
      DD=0.
      CC=0.
      PMRL=0.
      PMRH=0.
      PMRAA=0-
      PMRAA=0-
      PMRLB=0-
      PMRHBO=0.
      PMRHBO=0.
      IFLKK=2)361,362,363
      361 ND=91
      NC=1
      6D 10 364
      362 ND=68
      NC=1
      6D 10 364
      363 ND=91
      NC=69
      364 IF(IFSEARCH-EQ.0.,) GO TO 400
      DO 401 N=M,ND
      IF(IFPNM1)-1,1 401,402,403
      402 DD=1,0D

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APPENDIX A

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GO TO 401
401 CC=1.*CC
CONTINUE
NDD=DD22.
NCC=CC22.
N2=92
CALL SUBR (NDD, NCC, U, NC, ND, PHR, PML, PHRH)
GO TO 408
DO 340 N=NC, ND
IF (PHRH) -1.340, 341, 342
341 DD=1.*DD
PWRH=AH, I)+PML
GO TO 340
342 CC=1.*CC
PHRH=AH, I)+PHRH
340 CONTINUE
PWRH=PML/DD
PHRH=PHRH/CC
348 PWRH=PML/(1.0E-05)*(-.4)
PHRH=PHRH/(1.0E-15)*(-.4)
PWRH=PML/(1.0E-05)*(-.5)
PHRH=PHRH/(1.0E-05)*(-.5)
WRITE(6,6016)PWRH, PHRH
6016 FORMAT(2X, 2E16.3)
00 347 K=1,2
00 343 M=1,3
17 1K.E.1) GO TO 348
MN=4.8*10*(6*(K-1))+KD
EXP=100.*3.162*MN
PML=PML*0
PHRH=PHRH
GO TO 349
348 MN=4.5*10*(6*(K-1))+KD
EXP=100.*2.512*(M-1)
PML=PML*0
PHRH=PHRH
349 DO 346 N=NC, ND
IF (KJ=0.1) GO TO 450
IF (PHRH) .NE. -.1) GO TO 346
450 IF (PHRH) -1.344, 345, 346
345 AH, MN=AH, M/OPML*EXP
346 GO TO 346
346 AH, MN=AH, M/OPML*EXP
346 CONTINUE
IF (KJ=.4.1) GO TO 460
DO 461 N=NC, ND
PHRH=PHRH
461 CONTINUE
460 CONTINUE
343 CONTINUE
347 CONTINUE
360 CONTINUE
375 CONTINUE
C FOR PHRH LOW POWER DEVICES=1, HIGH POWER=2, EXCLUDED.
C FOR PHRH SAME AS PHRA EXCEPT LIMITED TO DEVICES WITHOUT CAPACITANCE DAMAGE
C MODEL DATA
WRITE(6,214)
WRITE(6,350)
350 FORMAT(2X, 12SHU- EXPERIMENTAL POWER TO DAMAGE/FATIGUE-.4), WHERE K

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APPENDIX A

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387 WRITE(6,387)
      FORMAT(2X,82H- SAME AS T EXCEPT MACC- LIMITTED TO DEVICES WITHOUT
     1  CAPACITANCE DAMAGE MODEL DATA//)
      WRITE(6,388)
388 FORMAT(122X,1IH U   ,11H V   ,11H X   ,11H Y   ,11H Z   ,11H /
     1
     C11H Y   ,11H H   ,11H K   ,11H P   ,11H R   ,11H S   ,11H T   ,
     C11H N   ,11H M   ,11H L   ,11H J   ,11H I   ,11H O   ,11H F   ,
     H11H D   ,11H E   ,11H G   ,11H B   ,11H C   ,11H D   ,11H E   ,
     H11H F   ,11H G   ,11H H   ,11H I   ,11H J   ,11H K   ,11H L   ,
     H11H M   ,11H N   ,11H O   ,11H P   ,11H Q   ,11H R   ,11H S   ,
     H11H T   ,11H U   ,11H V   ,11H W   ,11H X   ,11H Y   ,11H Z   ,
     H11H / / / )
      DO 389 N=1,91
      KA=4*(N-1)+1
      KB=4*(N-1)+2
      KC=4*(N-1)+3
      KD=4*(N-1)+4
      WRITE(6,359) DEVICE(KA),DEVICE(KB),DEVICE(KC),DEVICE(KD),
     1  DEVICE(N),N=64,72)
389 CONTINUE
      WRITE(6,214)
      WRITE(6,391)
391 FORMAT(122X,1IH X   ,11H Y   ,11H Z   ,11H /
     1
     C11H V   ,11H W   ,11H X   ,11H Y   ,11H Z   ,11H /
     C11H 7   ,11H 8   ,11H 9   ,11H 0   ,11H 1   ,11H /
     WRITE(6,357)
      DO 392 N=1,91
      KA=4*(N-1)+1
      KB=4*(N-1)+2
      KC=4*(N-1)+3
      KD=4*(N-1)+4
      WRITE(6,359) DEVICE(KA),DEVICE(KB),DEVICE(KC),DEVICE(KD),
     1  DEVICE(N),N=73,91)
392 CONTINUE
45      DO 394 N=1,91
      DO 396 N=1,81
      A1R,P1=AB5Data(N,1)
      V1R,N1=A1R,N1
394 CONTINUE
423 DO 299 N=1,25
      KK=1
      BB=0-
      MA=3*KK
      S1,I1=AI1,MA1
302 DO 300 N=1,3
      MA1=MA+KK-1
      DO 301 N=1,91
      IF I1(N,MA1).LE.SINK(N,MA1) GO TO 301
      SINK(N)=A1(N,MA1),
      BB=1-
      N2=N
      MA2=MAA
301 CONTINUE
302 CONTINUE
      IF I1(N,MAA).EQ.0.1 GO TO 299
      A1N2,MAA2)=0.
      BB=0-
      KK=1-MAA
      DO TO 302
299 CONTINUE
      WRITE(6,214)
      WRITE(6,280)
280 FORMAT(5X,59HQUANTITIES A THROUGH J AND L THROUGH Z ORDERED BY MAC
     1  LIMITTED//)

```

APPENDIX A

APPENDIX A

END

/*
 160-SYSIN DB *
 TC328A-20..52..140..3.23..837..4.
 TC328A-9..16..30..0..0..33..4.
 TC328A-20..90..300..305..1.05..15.
 TC335-20..44..100..0..0..293..15.
 TC336-30..70..160..65..0..0..15.
 TC336-70..112..62..5..0..0..15.
 TC2484-42..46..50..0..0..36.
 TC2484-15..48..160..0..0..0..36.
 TC3736-46..72..115..0..0..5..
 TC3736-110..255..90..0..0..5..
 TC930..30..74..180..0..0..3..
 TC930..16..60..230..0..0..0..10..0..3..
 TC2491-10..10..20..3..6..0..36..
 TC2491-18..30..53..0..0..124..36..
 TC2907-20..93..0..135..0..0..4..
 TC2907-53..78..110..0..0..4..
 TC2222-32..95..220..0..0..5..
 TC2222-40..135..400..0..0..0..5..
 TC386-2100..2300..2800..0..16..9..1..3..
 TC5911-1600..2700..4100..0..27..7..0..0..
 TC16..1400..2700..660..0..1..93..0..0..
 Q21MF..1..2..0..3..4..0..0..0..0..0..0..
 Q914A-15..80..420..233..423..-068..
 Q752A-93..360..2300..0..536..4..
 Q96115..510..1350..0..300..0..68..0..0..0..
 Q30268..17000..0..0..0..59..5..1..0..
 Q3611..3000..0..0..0..0..0..0..0..0..0..0..
 C3995A-0..0..0..0..83..910..
 Q30168..13000..0..0..0..0..0..0..0..0..0..
 Q9141..8000..0..0..0..18..1..3..
 Q1002..670..0..0..0..17..7..49..
 TC2057-32..4..16..120..0..0..0..2..
 TC2857..-8..4..2..6..8..-2..0..0..0..-2..
 TC3375..510..1300..0..18..0..-1..0..0..11..-
 TC3375..230..440..1300..0..0..0..11..-
 TC1490..730..2300..700..0..0..75..
 TC1490..1300..3800..1300..0..0..0..75..-
 TC3584..120..377..11..0..0..0..0..2..5..
 TC3584..490..2150..0..000..0..0..0..2..5..
 TC2894..16..50..170..0..0..0..-2..8..
 TC2894..12..19..30..0..0..0..36..-
 TC5829..6..17..47..0..0..-2..
 TC5829..4..10..0..22..0..0..0..-2..
 TC3013..6..-3..21..-100..0..0..-2..6..
 TC3013..20..31..5..52..0..0..0..36..-
 TC3018..5..-8..20..-86..0..0..-3..
 TC3018..10..-10..-22..0..0..0..69..C..-2..
 TC3M05..26..0..0..0..320..-
 TC3M05..20..50..130..0..0..0..-
 TC1613..14..300..2100..-3200..-301..-888..-8..
 TC1613..160..340..75..0..0..103..0..
 TC1485..700..-1100..-1700..0..0..1..-7..
 TC1485..3100..-3000..-290..0..0..0..-1..7..
 TC3439..10..-7..-78..0..0..0..-1..-
 TC3639..180..62..-22..0..0..0..1..-
 TC706..2..-8..17..-93..-0..0..3..-3..
 TC7..6..-8..18..-54..-0..0..3..-3..

APPENDIX A

4H1M36, 4H1L1 4H 4H
 4H1N39, 4H1P54 4H 4H
 4H1N30, 4H1L8 4H 4H
 4H1N61, 4H41 4H 4H
 4H1D52, 4H 4H 4H
 4H2N28, 4H571C, 4H-01 4H 4H
 4H2N28, 4H571E, 4H-01 4H 4H
 4H2N33, 4H751C, 4H-01 4H 4H
 4H2N33, 4H751E, 4H-01 4H 4H
 4H2N14, 4H902J, 4H4H(C, 4H-B)
 4H2N14, 4H302J, 4H4H(E, 4H-B)
 4H2N35, 4H941C, 4H-01 4H 4H
 4H2N35, 4H941E, 4H-01 4H 4H
 4H2N28, 4H941C, 4H-01 4H 4H
 4H2N28, 4H941E, 4H-01 4H 4H
 4H2N58, 4H291C, 4H-01 4H 4H
 4H2N58, 4H291E, 4H-01 4H 4H
 4H2N30, 4H132J, 4H4H(C, 4H-B)
 4H2N30, 4H132J, 4H4H(E, 4H-B)
 4HCA3U, 4H101C, 4H-01 4H 4H
 4HCA3D, 4H101E, 4H-01 4H 4H
 4H5M85, 4H2651, 4H71C(-, 4H-B)
 4H5H85, 4H2651, 4H71E(-, 4H-B)
 4H2N16, 4H133J, 4H4H(C, 4H-B)
 4H2N16, 4H133J, 4H4H(E, 4H-B)
 4H2N14, 4H851J, 4H4H(C, 4H-B)
 4H2N14, 4H851J, 4H4H(E, 4H-B)
 4H2N36, 4H394C, 4H-01 4H 4H
 4H2N36, 4H394E, 4H-01 4H 4H
 4H2N70, 4H633A, 4H4H(C, 4H-B)
 4H2N70, 4H633A, 4H4H(E, 4H-B)
 4H1B-6, 4H9-07, 4H35 4H 4H
 4H1B25, 4H81 4H 4H
 4H1N75, 4H1A8J, 4HAN 4H 4H
 4H1N64, 4H683J, 4HAN 4H 4H
 4H2N74, 4H633A, 4H4H(C, 4H-B)
 4H2N74, 4H633A, 4H4H(E, 4H-B)
 4H1M30, 4H2555J, 4HJAH 4H 4H
 4H1N20, 4H954 4H 4H
 4H1N76, 4H683J, 4HWN 4H 4H
 4H1N64, 4H683J, 4HWN 4H 4H
 4H1N12, 4H022RA, 4H2JAN 4H 4H
 4H1R17, 4H3LAJ, 4HJAH 4H 4H
 4H2N40, 4H611C, 4H-01 4H 4H
 4H2N40, 4H611E, 4H-01 4H 4H
 4H2N29, 4H711C, 4H-01 4H 4H
 4H2N29, 4H711E, 4H-01 4H 4H
 4H2N52, 4H611C(-, 4H-B) 4H 4H
 4H2N52, 4H611E(-, 4H-B) 4H 4H
 4H1N27, 4H80 4H 4H
 4H2N39, 4H641C, 4H-01 4H 4H
 4H2N39, 4H641E, 4H-01 4H 4H
 4H2N42, 4H683J, 4H4H(C, 4H-B)
 4H2N42, 4H683J, 4H4H(E, 4H-B)
 4H2N39, 4H333J, 4H4H(C, 4H-B)
 4H2N39, 4H333J, 4H4H(E, 4H-B)
 4H2N50, 4H1A2J, 4H4H(C, 4H-B)
 4H2N50, 4H1A2J, 4H4H(E, 4H-B)
 4H2N70, 4H551A, 4H4H(C, 4H-B)
 4H2N70, 4H551A, 4H4H(E, 4H-B)

APPENDIX A

APPENDIX A

RATIO OF EXPERIMENTAL POWER TO DAMAGE TO DC POWER MODEL PREDICTED VALUE FOR FOLLOWING MODEL DATA BASES

- A--ALL DEVICES
- B--ALL SILICON DEVICES
- C--ALL GERMANIUM DEVICES
- D--ALL DEVICES WITHOUT CAPACITANCE MODEL DATA
- E--ALL SILICON DEVICES WITHOUT CAPACITANCE MODEL DATA
- F--ALL GERMANIUM DEVICES WITHOUT CAPACITANCE MODEL DATA
- G--ALL SILICON DEVICES NOT INCLUDED WITHIN 145 REPORT
- H--ALL GERMANIUM DEVICES NOT INCLUDED WITHIN 145 REPORT
- I--ALL SILICON DEVICES INCLUDED WITHIN 145 REPORT
- J--ALL GERMANIUM DEVICES INCLUDED WITHIN 145 REPORT

FOR ALL CASES WHERE DATA BASE PERMITS. RATIOS ARE ONLY FOR THE REMAINING SILICON OR GE DEVICES NOT INCLUDED IN DATA BASE

A 0.0 ENTRY INDICATES NO DATA OR NC CALCULATION

FOR ITEM K, -1 INDICATES NO CALCULATION

JUNCTION REVERSE BIAS CONDITIONS ONLY NEGATIVE SIGN INDICATES ESTIMATED VALUES FOR POWER TO DAMAGE

ARITHMETIC MEAN USED FOR ALL MODEL DATA BASES

ALL PREDICTED VALUES FOR EXP. POWER TO DAMAGE INCLUDED IN DATA BASE CALCULATIONS

APPENDIX A

SILICON DEVICES	EXP. POWER TO DAMAGE AT INUS (WATTS)	EXP. POWER TO DAMAGE AT IUS (WATTS)	EXP. POWER TO DAMAGE AT 0-JUS (WATTS)	DC POWER RATING (WATTS)	DAM-CONST.		DC POWER (WATTS)	POWER CLASS
					DAM-CONST. DATA BOOK EXPERIMENTAL PARAMETERS (IN SECS.±.5)	DAM-CONST. DATA BOOK EXPERIMENTAL PARAMETERS (IN SECS.±.5)		
2N3280(C-B)	20.000	52.000	140.000	3.2300	0.8370	0.8370	0.4000	1-
2N3281(C-B)	9.000	16.000	50.000	0.3050	0.3300	0.3300	0.4000	1-
2N3350(C-B)	20.000	80.000	300.000	0.0500	1.0500	1.0500	0.1500	1-
2N3355(C-B)	20.000	44.000	100.000	0.0	0.2930	0.2930	0.1500	1-
2N3360(JANIC-B)	70.000	160.000	600.000	0.6500	0.0	0.1500	0.1500	1-
2N3361(JANIC-B)	75.000	112.000	625.000	0.40	0.0	0.1500	0.1500	1-
2N2484(C-B)	42.000	46.000	50.000	0.0	1.1	0.3600	1.1	1-
2N2484(C-B)	15.000	48.000	160.000	0.0	0.0	0.3600	0.3600	1-
2N3736(C-B)	44.000	72.000	115.000	0.0	0.0	0.5000	0.5000	1-
2N3755(C-B)	110.000	255.000	590.000	0.0	0.0	0.5000	0.5000	1-
2N9301(C-B)	30.000	74.000	160.000	0.058	0.0	0.3000	0.3000	1-
2N9311(E-B)	16.000	60.000	230.000	0.0	0.0	0.3000	0.3000	1-
2N2481(C-B)	10.000	10.000	10.000	0.23	0.0	0.3600	0.3600	1-
2N2491(C-B)	16.000	30.000	53.000	0.0	0.1240	0.1240	0.4000	1-
2N2907A(C-B)	20.000	53.000	135.000	1.1	0.0	0.4000	0.4000	1-
2N2907A(C-B)	53.000	76.000	110.000	0.0	0.0	0.4000	0.4000	1-
2N2222A(C-B)	32.000	85.000	220.000	0.0	0.0	0.5000	0.5000	1-
2N2222A(C-B)	60.000	135.000	400.000	0.0	0.0	0.5000	0.5000	1-
IN4384	210.000	230.000	280.000	1.0	16.90JU	16.90JU	1.3000	2-
F5911-3465	160.000	270.000	410.000	0.0	27.7000	27.7000	0.0	0-
14816	140.000	270.000	640.000	0.0	1.9300	1.9300	0.0	0-
1N21NE	1.100	2.000	3.400	0.0	0.0	0.0	0.0	0-
1M914A	15.000	80.000	420.000	0.2330	0.4230	0.4230	0.0460	1-
1M752A	83.000	340.000	2300.000	0.0	0.5360	0.5360	0.4000	1-
PC115	510.000	1350.000	3500.000	1.6660	J.0	J.0	2.0	2-
1N3U4B:JAN	1700.000	-33719.996	-17000.000	0.0	59.5000	59.5000	1.0000	2-
1N3611	3000.000	3000.000	3000.000	1.40	15.90JU	15.90JU	2.2000	2-
IN3995A	-2624.4-594	-82646.000	-26246.000	0.0	10.0000	10.0000	0.0	0-
IN3016B	1300.000C	-41079.996	-13000.00JU	1.7	23.10JU	23.10JU	1.0000	2-
1N4441	800.000	-35279.996	-60000.000	0.0	18.1000	18.1000	3.0000	2-
1002	670.000	-2117.200	-6700.00JU	1.1	17.70JU	17.70JU	7.9500	1-
2N2857(C-B)	1.2400	16.000	120.000	0.0	0.0	0.2000	0.2000	1-
2N3315(C-B)	0.8400	2.400	8.200	0.0	J.0	0.2000	0.2000	1-
2N3315(C-B)	50.000	1000.000	1600.000	0.0	0.0	11.0000	11.0000	2-
2N3375(C-B)	230.000	440.000	1310.000	1.67	0.0	0.3600	0.3600	2-
2N14901(JANIC-B)	700.000	2300.000	7000.000	0.0	0.0	75.0000	75.0000	2-
2N3514(C-B)	1300.000	3800.000	13500.000	0.0	0.0	2.5000	2.5000	2-
2N3544(C-B)	120.000C	370.000	1200.000	0.0	J.0	2.5000	2.5000	2-
2N30132(JANIC-B)	490.000	2150.000	10000.000	1.0	0.0	0.3600	0.3600	2-
2N2894(C-B)	14.000	50.000	170.000	0.0	0.0	0.3600	0.3600	1-
2N2894(C-B)	12.000	19.000	30.000	0.0	0.0	0.3600	0.3600	1-
2N5828(C-B)	6.000	17.000	47.000	0.0	0.0	0.2000	0.2000	1-
2N5629(C-B)	4.300	10.970	22.000	1.0	J.0	0.2000	0.2000	1-
2N30132(JANIC-B)	4.300	21.600	100.000	0.0	0.0	0.3600	0.3600	1-
2N30132(JANIC-B)	20.000	31.500	92.000	0.0	0.0	0.3600	0.3600	1-
CA3016(C-B)	5.600	20.000	64.000	0.0050	0.0	0.3600	0.3600	1-
CA3016(C-B)	4.000	19.60JU	22.00JU	1.1	0.3000	0.3000	0.3000	1-
SMB52.05171(C-B)	26.000	100.000	320.000	0.0	0.0	0.0	0.0	0-
SMB52.05171(C-B)	20.000	59.00JU	130.000	0.0	0.0	0.0	0.0	0-
2N16132(JANIC-B)	1400.000	2100.000	3200.000	0.3010	0.6680	0.6680	0.8000	1-
2N16132(JANIC-B)	700.000	340.000	750.000	1.0	1.1030	1.1030	0.8000	1-
2N14458(JANIC-B)	700.000	1100.000	1700.000	0.0	1.7000	1.7000	2.0	2-
2N14458(JANIC-B)	3100.000	-3100.000	-29100.000	0.0	1.7000	1.7000	2.0	2-

MANUFACTURERS		PRODUCTS		QUANTITY		UNIT PRICE		TOTAL VALUE	
2N3439(E-B)	10.000	27.00.0	78.00.0	1.000	2.0	0.0	0.0	1.0000	1.0000
2N3439(E-B)	180.000	620.000	2200.000	0.0	1.0	0.0	0.0	0.0	0.0
2N7063JAN(E-B)	2.800	17.00.0	93.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N7063JAN(E-B)	6.800	18.00.0	50.00.0	0.0	1.0	0.0	0.0	0.0	0.0
IR-69-6735	750.00.0	75.00.0	75.00.0	0.0	1.0	0.0	0.0	0.0	0.0
1N2580	17000.000	-53719.996	-170000.000	0.0	1.0	0.0	0.0	0.0	0.0
1N7511A1JAN	240.00.0	25500.000	25500.000	0.0	1.0	0.0	0.0	0.0	0.0
1N6858JAN	100.00.0	435.00.0	2000.00.0	0.0	1.0	0.0	0.0	0.0	0.0
1N2991B1JAN	100.00.0	-31599.996	-100000.000	0.0	1.0	0.0	0.0	0.0	0.0
1N3025B1JAN	1400.00.0	-14000.000	-140000.000	0.0	1.0	0.0	0.0	0.0	0.0
MD1054	25.00.0	32.590	44.00.0	0.0	1.0	0.0	0.0	0.0	0.0
1N746A5JAN	260.00.0	-20000.000	-153800.000	0.0	1.0	0.0	0.0	0.0	0.0
1N6451JAN	5.00.0	580.01.0	1625.01.0	0.0	1.0	0.0	0.0	0.0	0.0
1N1202R1JAN	100.00.0	10000.000	90000.000	0.0	1.0	0.0	0.0	0.0	0.0
1N1731A1JAN	800.00.0	2000.000	57000.000	0.0	1.0	0.0	0.0	0.0	0.0
PLATINUM DEVICES									
2N4C4A1(E-B)	120.00.0	160.00.0	230.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N606A1(E-B)	104.00.0	140.00.0	175.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N297A1(E-B)	2000.00.0	2210.00.0	2700.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N297A1(E-B)	1600.00.0	2100.00.0	3300.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N5264C-E-B	130.00.0	225.00.0	425.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N5264C-E-B	160.00.0	280.00.0	500.00.0	0.0	1.0	0.0	0.0	0.0	0.0
1N270	19.00.0	20.00.0	23.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N396A1C-E-B	115.00.0	170.00.0	230.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N396A1C-E-B	131.00.0	215.00.0	350.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N428H3A1N(E-B)	170.00.0	260.00.0	420.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N428H3A1N(E-B)	220.00.0	280.00.0	335.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N3931JAN(E-B)	300.00.0	1100.00.0	3400.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N3931JAN(E-B)	33.00.0	161.00.0	710.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N501A1AN(E-B)	3.00.0	17.00.0	86.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N501A1AN(E-B)	4.90.0	18.00.0	79.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N7C51JAN(E-B)	7.80.0	15.00.0	30.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N7051JAN(E-B)	3.60.0	6.60.0	12.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N6681JAN(E-B)	470.00.0	800.00.0	1400.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N6666H3JAN(E-B)	660.00.0	790.00.0	930.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N1042R1JAN(E-B)	500.00.0	150.00.0	4000.00.0	0.0	1.0	0.0	0.0	0.0	0.0
2N11622R1JAN(E-B)	36L-10G	17.00.0	750.00.0	0.0	1.0	0.0	0.0	0.0	0.0
1N2771JAN	14.00.0	18.00.0	23.00.0	0.0	1.0	0.0	0.0	0.0	0.0
MS1140	0.440	0.0	0.540	0.0	1.0	0.0	0.0	0.0	0.0

RATIO OF EXPERIMENTAL POWER TO DAMAGE TO DEVICE DC POWER RATING

	50.0	130.0	350.0
2N322A(-8)	22.5	40.0	75.0
2N322A(-3)	133.3	533.3	2100.0
2N3395(C-8)	133.3	293.3	666.7
2N3395E(B-1)	200.0	666.7	1666.7
2N3396JAMIC(-8)	466.7	746.7	4166.7
2N3396JAMIE(-8)	116.7	127.8	338.9
2N3396JAMIE(-3)	116.7	127.8	338.9
2N3396JAMIE(-1)	116.7	127.8	338.9

APPENDIX A

2N37361(C-0)	88.0	144.0	230.0
2N37361(E-0)	220.0	510.0	1180.0
2N9301(C-0)	100.0	246.7	600.0
2N931(E-0)	53.3	200.0	766.7
2N2481(C-0)	27.8	27.8	27.8
2N2481(E-0)	50.0	83.3	147.2
2N2907A(C-0)	50.0	132.5	337.5
2N2907A(E-0)	132.5	195.0	275.0
2N2222A(C-0)	64.0	170.0	440.0
2N2222A(E-0)	80.0	270.0	800.0
IN4384	1615.4	1769.2	2153.8
F5911-3465	0.0	0.0	0.0
IN816	0.0	0.0	0.0
IN21ME	0.0	0.0	0.0
IN914A	220.4	1176.5	6176.5
IN752A	207.5	850.0	5750.0
PL115	0.0	0.0	0.0
IN3068:JAN	17000.0	-53720.0	-170000.0
IN3611	1363.6	1363.6	1363.6
IN3995A	-2624.5	-3300.0	-26244.6
IN30160	13000.0	-41080.0	-130000.0
IN6141	2666.7	-8422.7	-26666.7
1002	705.3	-2228.6	-7052.6
2N28571(C-0)	62.0	80.0	600.0
2N28571(E-0)	4.2	13.3	41.7
2N33751(C-0)	45.5	90.9	163.6
2N33751(E-0)	20.9	40.0	118.2
2N14905:JAN1(C-0)	9.3	30.7	93.3
2N14905:JAN1(E-0)	17.3	50.7	173.3
2N35941(C-0)	60.0	160.0	480.0
2N35941(E-0)	196.0	86.0	4100.0
2N28941(C-0)	38.9	138.9	472.2
2N28941(E-0)	33.3	52.8	83.3
2N582291(C-0)	30.0	85.0	235.0
2N582291(E-0)	21.5	50.0	110.0
2B3013:JAN1(C-0)	11.9	50.3	277.8
2B3013:JAN1(E-0)	55.4	87.5	144.4
CA30181(C-0)	19.3	66.7	213.3
CA30181(E-0)	13.3	33.3	73.3
SM6526517(C-0)	0.0	0.0	0.0
SM6526517(E-0)	0.0	0.0	0.0
2N3613:JAN1(C-0)	1750.0	2625.0	4600.0
2N3613:JAN1(E-0)	200.0	425.0	937.5
2N746:JAN1(C-0)	22.7	60.0	166.7
IR-69-6735	0.0	0.0	0.0
IN2510	1307.7	-17647.1	-17658.2
IN751A:JAN	600.0	27.0	78.0
IN751A:JAN	180.0	620.0	2200.0
IN751A:JAN	9.3	56.7	310.0
2N706:JAN1(C-0)	22.7	60.0	166.7
IN29910:JAN	1000.0	-3160.0	-10000.0
IN36258:JAN	1400.0	-14000.0	-140000.0
MU1054	0.0	0.0	0.0
IN766A:JAN	6500.0	-50000.0	-384500.0
IN665:JAN	1250.0	1450.0	4362.5
IN1202R:JAN	8.3	83.3	750.0
IN1731A:JAN	200.0	500.0	1425.0

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2N64A(C-B)	8.00	1.066.7
2N64A(E-B)	6.93	933.3
2N97A(C-B)	57.1	62.9
2N97A(E-B)	40.0	60.0
2N526(C-B)	577.8	1060.0
2N526(E-B)	711.1	1288.9
1N270	237.5	250.0
2N396A(C-B)	575.0	650.0
2N396A(E-B)	650.0	1025.0
2N428M:JAN(C-B)	1133.3	1733.3
2N428M:JAN(E-B)	1466.7	1866.7
2N393:JAN(C-B)	8571.4	31426.6
2N393:JAN(E-B)	942.9	4571.4
2N501:JAN(C-B)	50.0	283.3
2N501:JAN(E-B)	81.7	300.0
2N705:JAN(C-B)	52.0	100.0
2N705:JAN(E-B)	24.0	44.0
2N666R:JAN(C-B)	3133.3	5333.3
2N666R:JAN(E-B)	4266.7	5266.7
2N1042RAJAN(C-B)	25.0	75.0
2N1042RAJAN(E-B)	18.0	65.0
1N277:JAN	175.0	225.0
HS1040	6.7	7.3

	A	1 USEC	0.1 USEC	0.01 USEC	B	1 USEC	0.1 USEC	0.01 USEC	C	1 USEC	0.1 USEC	0.01 USEC	D	10 USEC	1 USEC	0.1 USEC	0.01 USEC
2N328A(C-B)	0.04975	0.03766	0.02147	0.05073	0.03411	0.01748	0.00375	0.001050	0.00375	0.0	0.0	0.0	0.14670				
2N328A(E-B)	0.02239	0.01159	0.00460	0.02283	0.01050	0.00375	0.001050	0.00375	0.001050	0.0	0.0	0.0	0.14670				
2N335(C-B)	0.13266	0.15649	0.12269	0.13629	0.13994	0.09990	0.03320	0.013320	0.03320	0.0	0.0	0.0	0.39119				
2N335(E-B)	0.13266	0.15649	0.04090	0.07697	0.03230	0.07697	0.012245	0.05326	0.012245	0.0	0.0	0.0	0.39119				
2N336:JAN(C-B)	0.19899	0.13518	0.06543	0.20293	0.19591	0.020812	0.012245	0.05326	0.012245	0.0	0.0	0.0	0.58679				
2N336:JAN(E-B)	0.46431	0.21629	0.25560	0.47350	0.47350	0.020812	0.012245	0.05326	0.012245	0.0	0.0	0.0	0.58679				
2N2484(C-B)	0.11608	0.03701	0.00852	0.1838	0.03553	0.00694	0.00694	0.00694	0.00694	0.0	0.0	0.0	0.0				
2N2484(E-B)	0.04145	0.03862	0.02126	0.03498	0.02220	0.002220	0.002220	0.002220	0.002220	0.0	0.0	0.0	0.0				
2N3736(C-B)	0.07755	0.04171	0.01411	0.0929	0.03778	0.01169	0.01169	0.01169	0.01169	0.0	0.0	0.0	0.0				
2N3736(E-B)	0.21889	0.4773	0.07239	0.22322	0.13382	0.05894	0.05894	0.05894	0.05894	0.0	0.0	0.0	0.0				
2N930(C-B)	0.09949	0.07145	0.03681	0.10147	0.06472	0.02997	0.02997	0.02997	0.02997	0.0	0.0	0.0	0.29339				
2N930(E-B)	0.05306	0.0793	0.04703	0.05411	0.05248	0.03829	0.03829	0.03829	0.03829	0.0	0.0	0.0	0.15646				
2N2481(C-B)	0.02764	0.00805	0.00170	0.02118	0.00729	0.00139	0.00139	0.00139	0.00139	0.0	0.0	0.0	0.08150				
2N2481(E-B)	1.4975	0.02414	0.00903	0.05073	0.02187	0.00735	0.00735	0.00735	0.00735	0.0	0.0	0.0	0.14670				
2N2907A(C-B)	0.04975	0.03630	0.02070	0.05073	0.03477	0.01666	0.01666	0.01666	0.01666	0.0	0.0	0.0	0.0				
2N2907A(E-B)	0.13183	0.08449	0.01687	0.05116	0.01374	0.05116	0.01374	0.05116	0.01374	0.0	0.0	0.0	0.0				
2N2222A(C-B)	0.06368	0.02924	0.02699	0.06494	0.04461	0.02198	0.02198	0.02198	0.02198	0.0	0.0	0.0	0.0				
2N2222A(E-B)	1.77961	0.01721	0.04906	0.08117	0.07084	0.03996	0.03996	0.03996	0.03996	0.0	0.0	0.0	0.0				
IN4384	1.60721	0.51250	0.13213	1.63905	0.46422	0.10758	0.10758	0.10758	0.10758	0.0	0.0	0.0	0.0				
FS911-3465	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
IN816	0.0	0.C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
IA21ME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
IN914A	0.21947	0.34079	0.37889	0.22382	0.30850	0.3869	0.3869	0.3869	0.3869	0.0	0.0	0.0	0.0				
IN752A	0.20645	0.24622	0.35273	0.21054	0.22303	0.28720	0.28720	0.28720	0.28720	0.0	0.0	0.0	0.0				
PC115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
IN3U268:JAN	16.91462	15.56127	10.42856	17.24905	16.09522	8.49121	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
IN3611	1.35634	0.39501	0.08365	1.38361	0.35780	0.06811	0.06811	0.06811	0.06811	0.0	0.0	0.0	0.0				

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	D 1 USEC	E 0.1 USEC	F 10 USEC	G 1 USEC	H 0.1 USEC	I 10 USEC	J 1 USEC	K 0.1 USEC	L 10 USEC	M 1 USEC	N 0.1 USEC	O 10 USEC	P 1 USEC
2N1042RAJAN(C-B)	0.02487	0.02173	0.01227	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N1042RAJAN(E-B)	0.01791	0.02462	0.02300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N1777JAN	0.17612	0.06518	0.01764	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MS1040	0.00663	0.00212	0.00051	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N328A1(C-B)	0.12316	0.05773	0.26642	0.14428	0.05311	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N328A1(E-B)	0.03790	0.01237	0.11999	0.04439	0.01138	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N335(C-B)	0.59528	0.32989	0.70465	0.59192	0.30349	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N335(E-B)	0.27790	0.10996	0.71045	0.59156	0.10116	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3361JAN(C-B)	0.44212	0.17594	1.06567	0.51793	0.16166	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3361JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N4841(L-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N26844(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N37361(L-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N37361(E-B)	0.23369	0.09897	0.53284	0.21376	0.09105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N9301C-B)	0.18946	0.12666	0.28618	0.22197	0.11634	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N9301C-E)	0.02632	0.00458	0.14801	0.03083	0.00422	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N24811(C-B)	0.07895	0.02423	0.26642	0.09249	0.02234	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N24811(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N29071(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N29071(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2222A1(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2222A1(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN6384	1.67616	0.3526	8.61734	1.96356	1.32684	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FS911-3-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN816	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN21NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN916A	1.11458	0.01877	1.17537	1.151570	0.93725	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN752A	0.80529	0.94843	1.10563	0.94337	0.87254	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PC115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN30266:JAN	50.89406	20.04044	90.58205	59.462102	25.79674	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN3611	1.29191	0.22492	7.26594	1.51343	0.20553	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN5995A	7.86338	4.32884	13.98806	9.21174	3.98250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN3C168	38.91898	21.44269	69.68862	45.59254	19.72691	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN4141	7.98338	4.39850	14.20895	9.35232	4.04655	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1002	2.11139	1.16329	3.75769	2.47344	1.71720	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N28571(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N28571(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N33751(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N1490:JAN(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N1490:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N35841(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N35841(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N28941(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N28941(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N58291(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N58291(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N30131JAN1(C-B)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CA30181(C-B)	0.06316	0.03519	0.10301	0.07399	0.03237	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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IN645JAN	0.28189
IN120JAN	0.05206
IN173JAN	0.0
IN240JAN(C-B)	0.0
2N404A(E-B)	0.0
2N404A(E-B)	0.0
2N2971(C-B)	0.0
2N2971(E-B)	0.0
2N526(C-B)	0.0
2N526(E-B)	0.0
2N526(E-B)	0.0
2N270	0.0
2N390A(C-B)	0.0
2N396(E-B)	0.0
2N428H(JAN)(C-B)	0.0
2N428H(JAN)(C-B)	0.0
2N393JAN(C-B)	0.0
2N393JAN(E-B)	0.0
2N5018H(JAN)(C-B)	0.0
2N5018H(JAN)(E-B)	0.0
2N5018(JAN)(C-B)	0.0
2N705JAN(C-B)	0.0
2N705JAN(E-B)	0.0
2N468H(JAN)(C-B)	0.0
2N468H(JAN)(E-B)	0.0
2N1062RAJAN(C-B)	0.0
2N1062RAJAN(E-B)	0.0
IN277JAN	0.0
MS1040	0.0

N VALUE FOR RELATIONSHIP K=POLE(-N) DERIVED FROM EXPERIMENTAL DAMAGE DATA FOR TIME INTERVALS INDICATED

	K 10-1 USEC	K 1-1 USEC	K 10-1 USEC	K 1-1 USEC	K 10-1 USEC	K 1-1 USEC
2N328A(C-B)	1.41497	0.43012	1.42255	0.43012	0.24988	0.27300
2h328A(E-B)	0.24988	0.27300	0.26164	0.26164	0.57403	0.58805
2N335(C-B)	0.6204	0.34242	0.34242	0.34242	0.3555	0.34949
2N335(E-B)	0.34242	0.36798	0.36798	0.36798	0.35952	0.36350
2N336H(JAN)(C-B)	1.36798	0.20412	0.20412	0.20412	0.74666	0.47539
2N336H(JAN)(E-B)	0.20412	0.3951	0.3951	0.3951	0.34621	0.23786
2N2684(C-B)	0.3951	0.51515	0.51515	0.51515	0.52288	0.51401
2N2684(E-B)	0.51515	0.42138	0.42138	0.42138	0.20337	0.20862
2N3736(C-B)	0.42138	0.36515	0.36515	0.36515	0.36431	0.36473
2N3736(E-B)	0.36515	0.39211	0.39211	0.39211	0.38674	0.38908
2N931(C-B)	0.39211	0.57403	0.57403	0.57403	0.58358	0.57880
2N931(E-B)	0.57403	0.	0.	0.	0.	0.
2N2481(C-B)	0.	0.22185	0.22185	0.22185	0.24715	0.223450
2N2481(E-B)	0.	0.42325	0.42325	0.42325	0.46166	0.41465
2N2971(C-B)	0.	0.16782	0.16782	0.16782	0.14930	0.15856
2N2971(E-B)	0.	0.42627	0.42627	0.42627	0.41370	0.41864
2N2222A(C-B)	0.	0.52827	0.52827	0.52827	0.41173	0.50000
2N2222A(E-B)	0.	0.03951	0.03951	0.03951	0.05643	0.06247
1N4386	0.	0.22724	0.22724	0.22724	0.18142	0.20433
FS911-2465	0.	0.28524	0.28524	0.28524	0.37482	0.33003
IN816	0.	0.	0.	0.	0.	0.

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IN21ME	0.25964	0.23045
1A914A	0.72700	0.72016
1N752A	0.41240	0.43255
PC115	0.42276	0.38818
1N3026B:JAN	-1.00000	-1.00000
1N3611	0.0	0.0
1N3995A	-1.00000	-1.00000
1N30168	-1.00000	-1.00000
1N6141	-1.00000	-1.00000
1D02	-1.00000	-1.00000
2N28571(C-B)	0.11070	0.87006
2N28571(E-B)	-4.9769	3.49884
2N33751(C-B)	0.30103	0.25227
2N33751(E-B)	0.28172	0.47049
2N149C:JAN(C-B)	0.51663	0.48337
2N149U:JAN(E-B)	1.46586	1.53016
2N35841(C-B)	0.48902	0.51098
2N35841(E-B)	1.44226	1.66756
2N28941(C-B)	0.55286	0.53148
2N28941(E-B)	1.19957	1.19337
2N58291(C-B)	0.45230	0.44665
2N58291(E-B)	0.36653	0.36242
2N3C13:JAN(C-B)	0.46875	0.67778
2N3U13:JAN(E-B)	1.19728	0.21769
CA30181(C-B)	0.53760	0.50515
SM0526517(C-B)	0.58503	0.50115
SM0526517(E-B)	0.39794	0.41997
2N16133:JAN(C-B)	0.17609	0.1893
2N16133:JAN(E-B)	0.32736	0.34556
2N14852:JAN(C-B)	0.19629	0.18006
2N14852:JAN(E-B)	1.10000	-1.00000
2N34391(C-B)	0.43146	0.46673
2N34391(E-B)	0.53712	0.55003
2N706:JAN(C-B)	0.78329	0.73003
2N706:JAN(E-B)	1.42276	1.446370
IR-69-6735	1.00000	1.00000
1N258U	-1.00000	-1.00000
IN751A:JAN	1.01773	1.00860
1N685B:JAN	0.63849	0.66254
1N2991B:JAN	-1.00000	-1.00000
1N3025B:JAN	-1.00000	-1.00000
M01054	0.12710	0.11441
IN746A:JAN	-1.00000	-1.00000
1N645:JAN	0.64446	0.44743
1N1202R:JAN	1.00000	0.95224
IN1731A:JAN	0.39794	0.45864
2N404A1(C-B)	0.12494	0.15761
2N404A1(E-B)	0.12909	0.0991
2N297A1(C-B)	0.04139	0.08994
2N297A1(E-B)	0.17609	0.19829
2N526(C-B)	0.23824	0.27221
2N526(E-B)	0.25828	0.23557
1N270	0.02220	0.0670
2N396A1(C-B)	1.6975	1.3228
2N396A1(E-B)	0.19781	0.06517
2N628M1:JAN(C-B)	1.18452	1.20119
2N628M1:JAN(E-B)	0.16474	0.07789
2N3932:JAN(C-B)	0.56427	0.49709
2N3932:JAN(E-B)	0.68561	0.66329

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2N501A@JAN(C-B)	0.75333	0.70405	0.72869
2N7052@JAN(C-B)	0.56508	0.64235	0.69372
2N7052@JAN(C-B)	0.28460	0.30103	0.29251
2N7052@JAN(C-B)	0.26324	0.25964	0.26144
2N664M@JAN(C-B)	0.23099	0.24304	0.23702
2N664M@JAN(C-B)	0.09145	0.07086	0.08115
2N1042@JAN(C-B)	0.47712	0.42597	0.45134
2N1042@JAN(C-B)	0.47415	0.64461	0.65936
2N1042@JAN(C-B)	0.10914	0.10846	0.10780
1N2775@JAN	0.04139	0.05552	0.04845
MS106G			

ARITHMETIC MEAN VALUES FOR QUANTITIES A THROUGH J FOR PULSE DURATIONS OF 1E-1 AND 0.1 USEC

J-1UE+14	0-35E+14	0-16E+15
0.99E+03	0.38E+04	0.20E+05
0.11E+04	0.25E+04	0.68E+04
0.34E+03	0.11E+04	0.61E+04
-1.19E+13	-9.0E+13	0.66E+14
0.93E+03	0.17E+04	0.40E+04
0.15E+04	0.46E+04	0.14E+05
0.45E+03	0.67E+03	0.30E+04
1.34E+13	-3.2E+14	0.22E+05
0.13E+04	0.33E+04	0.90E+04

POWER TO DAMAGE EQUATION COEFFICIENTS FOR POPULATIONS DEFINED BY A THROUGH J

$$P = K1 T^{-1} + K2 T^{-1/2} + K3$$

K1	K2	K3
0.821E-03	0-249E+01	0-136E+03
0-116E-02	0.256E+01	0.527E+02
-1.863E-16	0-225E+01	0.354E+03
0-446E-03	0-458E+00	0.152E+03
0-558E-03	0-309E+00	0.342E+02
0-145E-04	0-103E+01	0.406E+03
0-603E-04	0-638E+01	0-144E+03
-0-528E-04	0-392E+00	0-327E+03
0.212E-12	0-110E+01	-0-222E+02
-0.101E-03	0.306E+01	0.366E+03

RATIO OF EXPERIMENTAL POWER TO PREDICTED VALUE BASED ON JUNCTION CAPACITANCE MODEL L-MODEL BASED ON D-A-T-A BOOK PARAMETERS N-MODEL BASED ON EXPERIMENTAL PARAMETERS AND WHERE DATA MISSING, BASED ON D-A-T-A. BOOK PARAMETERS

	10 USEC	1 USEC	.1 USEC	0.1 USEC	10 USEC	1 USEC	0.1 USEC	10 USEC	1 USEC	0.1 USEC	10 USEC	1 USEC	0.1 USEC	10 USEC	1 USEC	0.1 USEC	10 USEC	1 USEC	0.1 USEC
2N320A(C-B)	0.01958	0.01610	0.01371	0.007557	0.06214	0.05291	-0.07557	0.06214	0.05291	-0.05291	0.06214	0.05291	-0.05291	0.06214	0.05291	-0.05291	0.06214	0.05291	-0.05291
2N320A(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N325(C-B)	0.20738	0.26234	0.31113	0.3419	0.06325	0.05129	0.03419	0.06325	0.05129	0.03419	0.06325	0.05129	0.03419	0.06325	0.05129	0.03419	0.06325	0.05129	0.03419
2N325(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N330:JAN(C-B)	0.14596	0.10771	0.17786	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N336:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2484(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2484(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3734(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3734(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N930(C-B)	1.63581	1.27619	0.98166	0.45396	0.35413	0.27242	0.45396	0.35413	0.27242	0.45396	0.35413	0.27242	0.45396	0.35413	0.27242	0.45396	0.35413	0.27242	0.45396
2N930(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2481(C-B)	0.15579	0.04927	0.01558	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2481(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2907A(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2907A(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2222A(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2222A(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F5911-3465	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1N2114	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1N914A	1.20360	0.34261	0.57017	0.11215	0.18916	0.31407	0.18916	0.31407	0.18916	0.18916	0.31407	0.18916	0.31407	0.18916	0.31407	0.18916	0.31407	0.18916	0.31407
1N752A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PC115	2.35117	1.96628	1.52161	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1N3026B:JAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1N3611	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1N3695A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1N3016B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1N6141	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1UD2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2857(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2857(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3375(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3375(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N1490:JAN(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N1490:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3584(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3584(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2894(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2894(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N5829(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N5829(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3013:JAN(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3013:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CAC18(C-B)	3.27550	3.57204	3.61499	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CAC18(E-B)	14.49531	16.33365	16.49531	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPB526517(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPB526517(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX A

WEEKA DAMAGE CONSTANT BASED ON HIGH POWER OR LOW POWER RATING FOR ALL DEVICES
WEEKA DAMAGE CONSTANT BASED ON HIGH POWER OR LOW POWER RATING FOR ALL DEVICES

APPENDIX A

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2H3736(E-B)	0.664
2H2904(E-B)	0.181
2H30(E-B)	0.097
2H2691(E-B)	0.064
2H4811(E-B)	0.109
2H207A(E-B)	0.121
2H207A1(E-B)	0.320
2H2222A(E-B)	0.193
2H2222A1(E-B)	0.241
1M6384	0.566
F5911-3465	0.0
1M616	0.377
1M216	0.0
1M14A	0.091
1M52A	0.501
PC115	0.137
1M3026:JAN	4.581
1M3611	1.808
1M995A	0.0
1M30168	3.503
1M6141	2.156
1002	4.045
2H1577(E-B)	0.075
2H2557(E-B)	0.05
2H3751(E-B)	0.135
2H3751(E-B)	0.062
2H1490:JAN(E-B)	0.78189
2H1190:JAN(E-B)	1.550
2H5844(E-B)	0.032
2H3584(E-B)	0.032
2H2994(E-B)	0.085
2H2994(E-B)	1.072
2H5129(E-B)	0.036
2H5829(E-B)	0.026
2H3013:JAN(E-B)	0.026
2H3013:JAN(E-B)	1.121
(A)3019(E-B)	0.035
CA0181(E-B)	1.024
SH8265171(E-B)	0.0
SH8265171(E-B)	0.0
2H1613:JAN(E-B)	0.452
2H1613:JAN(E-B)	0.966
2H1655:JAN(E-B)	0.189
2H1655:JAN(E-B)	0.835
2H23391(E-B)	0.003
2H4391(E-B)	1.049
2H706:JAN(E-B)	0.017
2H16:JAN(E-B)	0.041
IR-9-6735	0.0
1M638U	4.581
IN71A:JAN	1.449
1M645B:JAN	1.604
1H2991B:JAN	2.695
1H325B:JAN	0.377
MOCS4	0.0
IN76A:JAN	15.697
1H655:JAN	3.019
1H1202A:JAN	1.027
1H1731A:JAN	0.27
2H404A(E-B)	0.0
	0.344
	0.268
	0.317
	0.434
	0.157

APPENDIX A

U* SAME AS O EXCEPT MODEL LIMITED TO DEVICES WITHOUT CAPACITANCE DAMAGE MODEL DATA
 V* SAME AS P EXCEPT MODEL LIMITED TO DEVICES WITHOUT CAPACITANCE DAMAGE MODEL DATA
 W* SAME AS L EXCEPT MODEL LIMITED TO DEVICES WITHOUT CAPACITANCE DAMAGE MODEL DATA
 X* SAME AS K EXCEPT MODEL LIMITED TO DEVICES WITHOUT CAPACITANCE DAMAGE MODEL DATA
 Y* SAME AS S EXCEPT MODEL LIMITED TO DEVICES WITHOUT CAPACITANCE DAMAGE MODEL DATA
 Z* SAME AS T EXCEPT MODEL LIMITED TO DEVICES WITHOUT CAPACITANCE DAMAGE MODEL DATA

APPENDIX A

PC115	-0.293	-0.309	0.301	0.293	0.245	0.190	0.263	0.277	0.269
IN30468:JAN	9.74	1.295	15.89	9.775	9.769	6.72	1.019	13.881	13.881
IN3611	1.725	0.687	0.273	1.725	0.546	0.173	1.546	0.615	0.245
IN395A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN30168	7.474	9.402	11.845	7.475	7.470	7.416	6.698	8.426	10.615
IN4141	4.599	5.786	7.239	4.600	4.597	4.601	4.122	5.185	6.532
10D2	1.454	1.315	16.567	10.455	10.449	10.457	23.804	29.185	37.723
2N2857(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2871(E-B)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3375(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3375(E-B)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N1490:JAN(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N1490:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3504(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3504(E-B)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2994(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N2994(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N5229(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N5229(E-B)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3013:JAN(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3013:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CA3018(C-B)	0.090	0.124	0.158	0.091	0.099	0.090	0.026	0.283	0.360
CA3018(E-B)	1.62	0.062	0.054	0.062	0.069	0.034	0.142	0.141	0.124
SMB26517(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMB26517(E-B)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SM8526517(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N1613:JAN(C-B)	21.845	13.044	7.913	21.847	10.364	4.994	49.740	29.701	18.017
2N1613:JAN(E-B)	2.497	2.112	1.655	2.497	1.678	1.171	5.685	4.809	4.223
2N1485:JAN(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N1485:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3329(C-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N3439(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N706:JAN(C-B)	0.044	0.106	0.230	0.144	0.184	0.145	1.099	0.240	0.524
2N716:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IR-89-6735	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN2580	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN721A:JAN	3.745	15.529	63.055	3.745	12.338	39.799	8.527	35.359	143.574
IN455B:JAN	1.560	2.702	4.445	1.560	2.147	3.121	3.553	6.152	11.261
IN2991B:JAN	5.749	7.232	9.111	5.750	5.746	5.751	5.153	6.482	8.166
IN305B:JAN	0.805	3.204	12.756	0.805	2.546	8.051	0.721	2.872	11.432
M01054	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
IN746A:JAN	40.568	124.230	380.305	40.572	98.701	240.062	92.373	282.868	865.946
IN645:JAN	7.802	3.603	4.018	7.802	2.862	2.346	17.764	8.203	9.149
IN102RA:JAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN1731A:JAN	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2N406A(C-B)	1.872	0.994	0.569	1.873	0.790	0.359	0.0	0.0	0.0
2N404AE(B)	1.623	0.870	0.433	1.623	0.691	0.273	0.0	0.0	0.0
2N297A(C-B)	1.150	0.504	0.246	1.150	0.400	0.155	0.0	0.0	0.0
2N297A(F-B)	0.805	0.481	1.301	0.805	0.382	0.190	0.0	0.0	0.0
2N526(C-B)	2.028	1.398	1.051	2.029	1.110	0.663	0.0	0.0	0.0
2N526(E-B)	2.497	1.801	1.236	2.497	1.431	0.780	0.0	0.0	0.0
IN270	0.296	0.124	0.057	0.296	0.099	0.036	0.0	0.0	0.0
2N396A(C-B)	1.794	1.056	0.569	1.795	0.839	0.359	0.0	0.0	0.0
2N396A(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N620M:JAN(C-B)	2.653	1.615	1.039	2.653	1.283	0.656	0.0	0.0	0.0
2N428M:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N593:JAN(C-B)	4.681	6.633	8.467	4.681	5.429	5.307	3.0	0.0	0.0
2N333:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N501A:JAN(C-B)	0.047	0.106	0.213	0.047	0.084	0.134	0.0	0.0	0.0
2N501A:JAN(E-B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2N705:JAN(C-B)	0.122	0.093	0.074	0.122	0.074	0.074	0.0	0.0	0.0

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2N58291(C-B)	0.0	0.0
2N58291(E-B)	0.0	0.0
2N58291(C-B)	0.0	0.0
2N50132JAN1(C-B)	0.0	0.0
2A30132JAN1(E-B)	0.0	0.0
CA30132C-B)	0.206	0.225
(A3C181E-B)	0.442	0.112
SHB5265171C-B)	0.0	0.0
SHB5265171(E-B)	0.0	0.0
2N16132JAN(C-B)	49.744	23.598
2N16132JAN1(E-B)	5.885	3.821
2N14852JAN1(C-B)	0.0	0.0
2N14852JAN1(E-B)	0.0	0.0
2N363391(C-B)	0.0	0.0
2N363391(E-B)	0.0	0.0
2N7062JAN1(C-B)	0.099	0.191
2N7062JAN1(E-B)	0.0	0.0
IR-69-6335	0.0	0.0
IN2580	0.0	0.0
INT51AJAN	8.528	28.092
IN485B1JAN	3.553	4.888
IN29910JAN	5.153	5.154
IN30258JAN	4.721	2.282
HD1054	0.0	0.0
1M744AJAN	92.382	224.740
IN645FJAN	17.666	6.517
IN12U2RAJAN	3.0	0.0
IN1731AJAN	0.0	0.0
2N606AA(C-B)	0.0	0.0
2N404AE(B)	0.0	0.0
2N297AC(B)	0.0	0.0
2N297AE(B)	0.0	0.0
2N5264C-B)	0.0	0.0
2N5261E-B)	0.0	0.0
IN271	0.0	0.0
2N3932JAN1(E-B)	0.0	0.0
2N3932JAN1(C-B)	0.0	0.0
2N5012JAN1(L-B)	0.0	0.0
2H5012JAN1(E-B)	0.0	0.0
2N7C52JAN(C-B)	0.0	0.0
2N648H2JAN1(E-B)	0.0	0.0
2N396AE(B)	0.0	0.0
2N428H2JAN1(C-B)	0.0	0.0
2N428H2JAN1(E-B)	0.0	0.0
2N3932JAN1(C-B)	0.0	0.0
2N3932JAN1(E-B)	0.0	0.0
2N5012JAN1(L-B)	0.0	0.0
2H5012JAN1(E-B)	0.0	0.0
2N7C52JAN(C-B)	0.0	0.0
2N648H2JAN1(E-B)	0.0	0.0
2N466H2JAN1(C-B)	0.0	0.0
2N466H2JAN1(E-B)	0.0	0.0
2N1042RAJAN(C-B)	0.0	0.0
2N1042RAJAN(E-B)	0.0	0.0
IN2772JAN	0.0	0.0

QUANTITIES A THROUH J AND L WHICH ARE RELATED TO MAGNITUDE

SILICON DEVICES ONLY FOR L, M, AND N

APPENDIX A

23.28696	16.91402	15.56127	14.48367	12.93426	10.46465	9.10403	8.58823
3.52008	7.37478	6.44713	5.95910	5.11189	4.24504	3.91071	2.65313
2.61119	2.44098	2.40429	1.81431	1.80446	1.74115	1.60996	1.54493
1.52561	1.45925	1.39292	1.35674	1.34222	1.30108	1.24260	1.12760
0.9994	0.93809	0.91537	0.80220	0.79595	0.76039	0.70170	0.68983
0.66558	0.61344	0.58627	0.57486	0.57255	0.57209	0.51250	0.50210
0.49076	0.46431	0.43264	0.42003	0.40968	0.39788	0.39501	0.37336
0.35273	0.34079	0.30849	0.29692	0.29677	0.27036	0.25560	0.24622
0.24622	0.24538	0.24538	0.23630	0.21947	0.21889	0.20645	0.19899
0.19519	0.19501	0.18744	0.17950	0.17819	0.17412	0.15449	0.14484
0.13760	0.13632	0.13518	0.13496	0.13266	0.13213	0.12269	0.12111
0.14608	0.11587	0.10735	0.09949	0.08793	0.08155	0.08497	0.08497
0.08365	0.08207	0.08125	0.08077	0.07960	0.07821	0.07239	0.07145
0.07055	0.06543	0.06518	0.06368	0.06169	0.06134	0.05751	0.05649
0.05527	0.05306	0.05174	0.04975	0.04975	0.04975	0.04924	0.04776
0.04703	0.04601	0.04522	0.04287	0.04171	0.04146	0.04090	0.03869
0.03862	0.03838	0.03766	0.03701	0.03681	0.03681	0.03456	0.02897
0.02857	0.02764	0.02726	0.02699	0.02633	0.02535	0.02487	0.02414
0.02614	0.02388	0.02300	0.02317	0.02255	0.02239	0.02147	0.02134
0.02070	0.01931	0.01924	0.01921	0.01821	0.01791	0.01664	0.01738
0.01725	0.01704	0.01690	0.01687	0.01641	0.01529	0.01468	0.01442
0.01327	0.01309	0.01275	0.01227	0.01227	0.01188	0.01159	0.01063
0.01004	0.00995	0.00966	0.00929	0.00929	0.00903	0.00886	0.00829
0.00805	0.00782	0.00775	0.00675	0.00663	0.00578	0.00553	0.00511
0.00460	0.00460	0.00450	0.00416	0.00377	0.00252	0.00212	0.00051
0.00473							
19.20512	17.24905	14.09522	13.19046	13.11016	10.77977	8.49121	6.59523
6.49373	6.63029	3.67336	3.18421	2.70513	2.66291	2.2101	1.77564
1.63989	1.63975	1.42051	1.48361	1.33195	1.32265	1.31087	1.01465
0.82913	0.71560	0.68876	0.65317	0.60879	0.58476	0.47350	0.45655
0.41780	0.41586	0.39959	0.38046	0.35780	0.35227	0.30865	0.22565
0.22582	0.22322	0.22303	0.21054	0.20812	0.20293	0.20293	0.20292
0.19979	0.19887	0.19591	0.18264	0.16978	0.16268	0.13994	0.13444
0.13382	0.13119	0.12245	0.11838	0.11151	0.10989	0.10753	0.09929
0.08117	0.07697	0.07118	0.07084	0.06611	0.06494	0.06472	0.05637
0.05611	0.05328	0.05248	0.05116	0.05073	0.05073	0.04995	0.04883
0.04652	0.04461	0.04228	0.03996	0.03946	0.03883	0.03778	0.03644
0.03798	0.03477	0.03411	0.03353	0.03330	0.03330	0.02997	0.02997
0.02385	0.02359	0.02300	0.02296	0.02263	0.02230	0.02220	0.02198
0.02187	0.02122	0.02099	0.01962	0.01759	0.01749	0.01686	0.01574
0.01531	0.01487	0.01387	0.01385	0.01374	0.01353	0.01329	0.01312
0.01149	0.01066	0.01050	0.01015	0.00947	0.00947	0.00875	0.00866
0.00832	0.00832	0.00817	0.00735	0.00721	0.00708	0.00694	0.00590
0.00466	0.00466	0.00426	0.00416	0.00390	0.00375	0.00366	0.00205
14.72055	12.69399	8.11673	4.04033	3.03070	2.96712	2.12019	1.61771
1.38886	1.0321	0.93952	0.89284	0.75756	0.68906	0.67339	0.65655
0.54713	0.54450	0.51238	0.42404	0.42404	0.40747	0.37103	0.33791

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J-33674	-28623	0.26519	0.22235	0.22490	0.21720	0.19952	0.17679	0.17427	0.16572
0.11926	0.11264	0.09938	0.08945	0.07733	0.05683	0.05411	0.04924	0.04735	0.04357
0.03975	0.03788	0.02379	0.02031	0.01631	0.01031	0.02987	0.02499	0.02385	0.02357
0.02273	0.01749	0.01705	0.01429	0.01212	0.01169	0.00631	0.00292	0.00126	
63-42088	50.89406	49.87672	47.36677	38.91898	36.14102	29.77527	28.04044	25.16792	23.09212
16-27051	16.02310	13.26353	11.51517	9.19297	7.98338	7.56336	7.02380	7.49997	
5-13437	5.05277	4.73442	4.39850	4.3888	4.10749	4.0081	3.66745	3.32512	
2-99377	2.99392	2.48691	2.36714	2.11139	2.08635	2.06919	2.03415	1.76035	1.69516
1-68701	1.67616	1.64944	1.66647	1.64215	1.53948	1.37372	1.31955	1.22109	
1-17357	1.16329	1.14558	1.08777	1.01055	0.98483	0.94739	0.88624	0.80529	
0-65661	0.64068	0.65978	0.64719	0.60879	0.56679	0.51344	0.50528	0.46184	
0-64212	0.42264	0.39119	0.39119	0.36456	0.35526	0.32989	0.31156	0.29239	0.27790
0-26843	0.22291	0.23685	0.23642	0.23369	0.22492	0.21316	0.19243	0.18969	0.18548
0-17594	0.16765	0.15648	0.15643	0.15256	0.14670	0.14670	0.14670	0.12316	
0-11736	0.10996	0.09897	0.09747	0.08150	0.07895	0.06601	0.06316	0.05773	
0-05664	0.05672	0.05369	0.05113	0.04742	0.04742	0.03912	0.03790	0.03519	0.03299
0-03158	0.02736	0.02632	0.02428	0.01956	0.01555	0.01272	0.01237	0.01210	0.00695
0-010458	0.010137								
90-58205	69.26862	59.62102	58.34615	55.49240	45.59254	34.63632	25.79674	21.26437	19.72691
15-53767	14.2095	13.98436	9.61778	9.35232	9.21174	8.60734	8.4970	7.26594	
6-93615	6.66045	5.32836	4.06655	3.98250	3.75789	3.50712	3.19701	2.91335	2.47344
2-13154	1.96358	1.93114	1.60628	1.51746	1.51343	1.30570	1.21396	1.15537	1.19563
1-07020	1.06567	1.06567	0.94337	0.93725	0.87254	0.71045	0.71045	0.61647	
1-59192	0.52284	0.51793	0.51793	0.47169	0.32556	0.30349	0.28418	0.2376	0.26642
0-26642	0.22197	0.20693	0.16186	0.14801	0.14426	0.14226	0.11989	0.11634	
2-10116	0-09249	0.09105	0.07399	0.07104	0.06289	0.05311	0.04973	0.04704	0.04439
0-03699	0.03237	0.03083	0.02234	0.01136	0.01113	0.00622			
24-16864	16.29904	9.37362	3.35347	3.22408	2.32209	1.21296	1.04763	0.85620	0.77215
1-76107	C-74204	0.69663	0.64482	0.61837	0.61540	0.46451	0.56421	C-55288	0.51384
0-46995	C-8149	0.35661	0.29026	0.28611	0.25419	0.18229	0.17128	0.13113	0.13602
0-07153	C-01153	0.06116	0.06045	0.05565	0.05351	0.04976	0.04281	0.03800	0.03627
0.02346	0.01919	0.01714	C.00443	0.00207					
26-67943	11.03666	10.94316	9.71422	4.42344	4.23573	3.86229	3.06408	1.36789	
1-14039	0.01231	0.00737	0.00441	0.05246	0.01456	0.69287	0.69161	0.57452	
1-55531	1-39099	0.38082	0.21735	0.28169	0.27755	0.27755	0.26833	0.2066	0.18822
0-15265	C-14162	0.13570	0.13033	0.13033	0.12772	0.11730	0.10943	0.09302	
1-68399	1-6555	0.5224	0.5163	0.44740	0.36226	0.33331	0.32377	0.32339	0.31128
0-03040	C-02962	0.02534	0.02172	0.02151	0.01990	0.01955	0.01927	0.01915	0.01860
1-11824	C-01751	0.01631	0.01460	0.01477	0.01459	0.01401	0.01363	0.01313	0.01277
0-01246	C-01246	0.01246	0.01156	0.01155	0.01135	0.01130	0.01109	0.01094	0.01002

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0.00075	0.00869	0.00820	0.00778	0.00763	0.00713	0.00671	0.00652	0.00648	0.00608
-1.10608	0.1591	0.00578	0.00543	0.00541	0.00509	0.00285	0.00284	0.00274	
93.53462	47.19267	19.25713	19.25611	9.58228	8.00845	7.90335	7.03699	6.86439	
5.96971	3.29391	2.80296	2.69000	2.60275	2.54529	2.15038	1.68500	1.53912	
1.45960	1.38039	1.29136	1.27635	1.26776	1.10728	0.445048	0.39302	0.36107	
0.33786	0.27682	0.19257	0.19257	0.18341	0.15016	0.12763	0.11678	0.11229	
0.07703	-0.6617	0.05615	0.05393	0.04743	0.01497	0.1101	0.03002		
31.69615	24.23669	16.93386	12.87296	6.90781	5.28245	4.97163	4.89295	3.01164	2.844061
2.60091	2.54231	1.31467	1.08358	1.06643	0.87004	0.69837	0.55641	0.42731	0.41226
0.41016	0.38686	0.37287	0.36866	0.28658	0.26636	0.25098	0.24858	0.24703	
1.23398	-0.23365	0.21751	0.1844	0.16931	0.16713	0.16406	0.14915	0.14624	
0.11932	0.09943	0.09322	0.09322	0.09322	0.09192	0.08752	0.08461	0.08127	0.07768
0.7731	0.62267	0.6111	0.5941	0.05327	0.05179	0.04795	0.04512	0.04334	0.04195
0.04178	0.04152	0.04074	0.04004	0.03251	0.03115	0.02709	0.02611	0.02438	0.01806
-0.1788	0.1422	0.01371	0.01253	0.01117	0.00935	0.00870	0.00598	0.00584	0.00305
0.00013									
0.60458	0.53761	0.52397	0.43664	0.38767	0.32083	0.30078	0.28073	0.24604	0.20914
0.17949	0.16977	0.12917	0.07920	0.04318	0.03183	0.03023	0.01891	0.01805	0.01044
18.73335	14.70956	14.49531	10.00529	6.97798	3.61499	3.57206	3.36278	3.27550	2.35117
1.96828	1.63581	1.52161	1.27009	1.21057	0.98166	0.69971	0.57017	0.36641	0.34341
1.31113	0.26234	0.20738	0.21360	0.15579	0.14596	0.10771	0.07786	0.04927	0.01958
0.01610	0.01558	0.01371	0.01371						
1.614206	6.73626	5.92027	5.81498	5.55653	4.98601	4.91271	4.85527	3.30155	2.42220
2.39030	2.36526	2.30324	2.29008	1.87199	1.78011	1.77979	1.77067	1.39921	1.39006
1.39781	1.39693	1.35731	1.13086	1.12968	1.12448	1.12677	1.04891	1.03539	1.00018
1.00018	1.00000	0.90375	0.90359	0.90302	0.75086	0.71207	0.63444	0.59671	0.59192
0.51761	0.48972	0.45908	0.45996	0.43924	0.39298	0.35413	0.31407	0.27242	0.24198
0.22793	0.21587	0.18916	0.18771	0.18267	0.16114	0.15020	0.14278	0.13612	0.13520
0.11973	0.11971	0.11964	0.11215	0.10796	0.09749	0.08625	0.07557	0.06214	0.05668
0.05291	0.05261	0.05129	0.04664	0.04682	0.04325	0.03419	0.02876	0.02445	
								0.00773	

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18.-33365	14.49531	14.-14206	10.08529	6.73626	5.92027	5.01498	5.55653	4.98601	4.91271
4.-68527	3.6199	3.5729	3.30155	3.27550	2.42220	2.3030	2.36528	2.35117	2.30324
7.-29608	1.96828	1.87199	1.78011	1.77979	1.77867	1.5161	1.39921	1.39781	1.39006
1.-39693	1.35731	1.21057	1.13986	1.12968	1.12948	1.12177	1.06891	1.03539	1.00016
1.-00018	1.00000	0.90375	0.90359	0.90202	0.75088	0.71257	0.69971	0.63444	0.59671
-1.59192	-5.176	0.48972	0.45908	0.45396	0.43924	0.39228	0.36441	0.3513	0.31407
0.-27242	0.24198	0.22793	0.21587	0.18916	0.18871	0.18267	0.16114	0.15020	0.14596
0.-13612	0.13520	0.11973	0.11971	0.11964	0.1125	0.1125	0.10796	0.10771	0.09749
0.-14278	0.07857	0.07557	0.06216	0.05969	0.05291	0.05241	0.05129	0.04669	0.04662
0.-08625	0.0786	0.02876	0.02876	0.02876	0.02876	0.02876	0.02876	0.02876	0.02876
0.-03425	0.03419	0.03425	0.03425	0.03425	0.03425	0.03425	0.03425	0.03425	0.03425
152.-59288	49.86266	25.29985	16.27759	13.91037	8.76486	8.15436	8.15436	8.71535	8.644741
6.-67266	6.-47186	6.-23568	6.-20701	5.-27666	5.-23379	5.-14551	5.-14551	4.-94983	4.-79668
4.-19463	4.-00679	3.-63480	3.-83734	3.-80756	3.-61476	3.-37331	3.-17480	3.-13031	3.-04605
3.02677	2.-96249	2.-76151	2.-42142	2.-28195	1.-99383	1.-98430	1.-96890	1.-87818	1.-86890
1.61225	1.50253	1.44552	1.-38901	1.-37733	1.-62414	1.-6430	1.-00170	1.-00170	0.-38830
0.92270	0.90803	0.84738	0.-84738	0.-81368	0.-81368	0.-75127	0.-74411	0.-72276	0.-71997
0.-69764	0.-69451	0.-68867	0.-65111	0.-64799	0.-65562	0.-65553	0.-62606	0.-62357	0.-62009
-0.60535	-0.58537	-0.56076	-0.51963	-0.51092	-0.49608	-0.47967	-0.45787	-0.43824	-0.43170
-0.42375	-0.42275	-0.42375	-0.42166	-0.41670	-0.41670	-0.39877	-0.39877	-0.3986	-0.3986
0.39346	0.36148	0.35975	0.34892	0.34725	0.-33666	0.-33577	0.-33161	0.-32533	0.-32533
0.30649	0.29745	0.27914	0.-2773	0.-27713	0.-27547	0.-27341	0.-26508	0.-26295	0.-25906
0.25303	0.25042	0.-49214	0.-24095	0.-22819	0.-22219	0.-22819	0.-2187	0.-2187	0.-2187
0.21184	0.2066	0.-20484	0.-2034	0.-19938	0.-1938	0.-19440	0.-19187	0.-18782	0.-18782
0.18074	0.18443	0.-17944	0.-17839	0.-17446	0.-17363	0.-16867	0.-16266	0.-15874	0.-15874
0.15829	0.15637	0.-15134	0.-15134	0.-14954	0.-14631	0.-14390	0.-13890	0.-13832	0.-13832
0.13394	0.13254	0.-13209	0.-12951	0.-12521	0.-12521	0.-12521	0.-12521	0.-12521	0.-12521
0.12461	0.12461	0.12049	0.11963	0.11904	0.-11895	0.-11665	0.-11610	0.-11610	0.-11610
0.10896	0.10896	0.10553	0.10017	0.09922	0.-09922	0.-09391	0.-09227	0.-09227	0.-09227
0.09114	0.09114	0.08533	0.-08154	0.-07851	0.-07838	0.-07763	0.-07513	0.-07477	0.-07477
0.08765	0.08634	0.08533	0.06236	0.05756	0.-05635	0.-05448	0.-05302	0.-05258	0.-05234
0.06962	0.06962	0.06261	0.04961	0.04961	0.-04883	0.-04735	0.-04663	0.-04486	0.-04486
0.05159	0.04985	0.04985	0.04237	0.-04237	0.-04237	0.-04237	0.-03988	0.-03756	0.-03738
0.-04458	0.-04458	0.04257	0.-03207	0.-12976	0.-2976	0.-2976	0.-26992	0.-26992	0.-25904
0.-03486	0.-03631	0.-03068	0.-02962	0.-02282	0.-02282	0.-02282	0.-02183	0.-01878	0.-01753
0.-03632	0.-0292	0.-02692	0.-02692	0.-00648	0.-00648	0.-00648	0.-00325	0.-00325	0.-00325
0.-0292	0.-02492	0.-01191	0.00992	0.00814	0.00814	0.00814	0.00814	0.00814	0.00814
0.-01645	0.-01645	0.-01645	0.-01645	0.-01645	0.-01645	0.-01645	0.-01645	0.-01645	0.-01645
96.-31378	39.-60262	16.-27904	15.-96650	8.-77997	5.-14688	5.-14697	5.-14697	5.-14697	5.-14697
5.16272	5.16272	4.-23861	4.-19572	4.-19498	4.-1933	4.-1933	4.-1933	4.-1933	4.-1933
3.-93515	3.-93267	3.-13056	3.-02757	3.-02704	3.-02513	2.-94275	2.-94275	2.-94275	2.-94275
2.-42017	2.-17814	2.-12917	2.-0393	1.-87835	1.-58410	1.-56410	1.-56410	1.-56410	1.-56410
1.-34025	1.-25245	1.-16848	1.-06440	1.-01762	1.-00179	1.-00179	1.-00179	1.-00179	1.-00179
1.-86136	1.-81395	0.-81395	0.-75134	0.-72003	0.-68873	0.-6724	0.-6724	0.-6724	0.-6724
0.-62612	0.-40561	0.-58239	0.-57424	0.-55444	0.-51968	0.-51483	0.-50493	0.-46967	0.-44553
0.-43828	0.-43828	0.-42379	0.-42379	0.-42379	0.-40593	0.-39358	0.-39358	0.-39358	0.-39358
0.-36378	0.-31662	0.-33184	0.-31682	0.-31682	0.-31311	0.-28720	0.-28720	0.-27722	0.-27722
0.-27248	0.-26732	0.-26615	0.-26302	0.-26297	0.-25848	0.-25045	0.-25045	0.-24216	0.-24216
0.-22767	0.-22177	0.-22018	0.-22018	0.-21193	0.-21193	0.-21193	0.-21193	0.-21061	0.-20979
0.-25562	0.-20144	0.-20036	0.-19376	0.-19376	0.-18784	0.-18784	0.-18784	0.-17257	0.-17257
0.-20662	0.-16214	0.-15841	0.-15841	0.-15841	0.-15438	0.-15135	0.-15135	0.-14833	0.-14833
0.-16831	0.-16831	0.-16831	0.-16831	0.-16831	0.-16831	0.-16831	0.-16831	0.-16831	0.-16831

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4.35656	3.19933	2.98081	2.16786	2.14077	2.04213	1.87793	1.51026	1.49756
4.35656	1.11602	1.08913	1.00324	0.8892	0.86492	0.82234	0.81685	0.78555
4.35656	0.75875	0.75513	0.70794	0.7456	0.63545	0.60911	0.59521	0.58069
4.35656	0.49105	C.46948	0.46067	0.45847	0.45308	0.43557	0.43357	0.40177
4.35656	0.37756	0.33803	0.26138	0.24811	0.22463	0.18878	0.12933	0.09550
4.35656	0.08522	0.05310	0.05310	0.04878	0.04607	0.04055	0.03335	0.03235
4.35656	-0.12481	0.12451	0.12481	0.1788	0.1295	0.0917	0.08390	0.07997
4.35693	3.19942	2.36827	2.31502	2.04231	1.87810	1.72238	1.70095	1.49767
4.35693	1.8923	0.9325	0.88500	0.88500	0.81692	0.72269	0.70800	0.70441
4.35693	0.62366	0.60283	0.55977	0.50487	0.44442	0.47662	0.46952	0.46557
4.35693	0.37569	0.36691	0.34448	0.34044	0.33806	0.30994	0.30142	0.28438
4.35693	0.28597	0.25359	0.23810	0.22465	0.15660	0.12935	0.11916	0.09531
4.35693	0.05310	0.04306	0.04306	0.03875	0.03660	0.03336	0.02229	0.02451
4.35693	0.02042	0.01566	0.01566	0.01421	0.01017			
360.30542	124.22978	63.05457	40.56848	21.86656	16.56728	15.52672	15.48913	13.15096
360.30542	12.75575	12.29514	11.55419	9.77386	9.42116	9.11125	8.40728	7.90163
360.30542	7.47412	7.33553	7.23243	6.83264	5.70595	5.74933	5.68277	5.68277
360.30542	4.66098	4.59946	4.41018	3.60266	3.46182	3.20424	2.70200	2.65255
360.30542	2.49652	2.11191	2.02842	1.87239	1.84555	1.80133	1.79437	1.62274
360.30542	1.61499	1.39758	1.29517	1.23636	1.20736	1.14987	1.0595	1.03855
360.30542	0.38555	0.99384	0.86961	0.80491	0.74182	0.68662	0.61796	0.53312
360.30542	0.56873	0.56873	0.52641	0.50352	0.46692	0.40684	0.46810	0.46810
360.30542	0.44595	0.43480	0.43223	0.39564	0.37269	0.34418	0.32300	0.32307
360.30542	0.31207	0.31898	0.3067	0.29646	0.28322	0.27334	0.27334	0.25511
360.30542	0.24965	0.24727	0.24600	C.23605	0.22996	0.21265	0.18634	0.15825
360.30542	0.14043	0.13105	0.12423	0.12171	0.11181	0.10560	0.09938	0.09317
360.30542	0.09550	0.07418	0.07418	0.06261	0.05687	0.05687	0.05687	0.05687
360.30542	0.04369	-2473						
240.04161	96.70116	40.57208	21.86651	12.33765	10.45696	10.45512	10.44850	10.36362
240.04161	9.77472	9.76854	8.5119	7.80233	7.47610	7.47474	7.47006	7.33419
240.04161	5.74384	5.74384	5.30652	4.99437	4.68140	4.60068	4.59897	5.75005
240.04161	3.74512	3.58971	3.12143	2.86233	2.65279	2.54578	2.53620	2.18504
240.04161	2.16615	2.02860	1.81256	1.79453	1.77495	1.67792	1.62288	1.43117
240.04161	1.29519	1.26311	1.27474	1.17055	1.14997	1.11039	0.83896	0.80498
240.04161	0.78037	0.78037	0.69091	0.66331	0.65551	0.65553	0.49697	0.46814
240.04161	-4.68114	-4.68124	C.40015	C.39480	0.39480	0.38187	0.36519	0.35897
240.04161	0.34545	0.3209	0.31209	0.31209	0.29649	0.29324	0.28093	0.28088
240.04161	0.35697	0.25662	0.24967	0.24549	C.23407	0.21850	0.21716	0.18478
240.04161	-2.7313	0.16102	0.15607	0.15605	0.15527	0.14835	0.14515	0.13422
240.04161	0.18977	0.17252	0.17252	0.09870	0.09051	0.08390	0.08272	0.07997

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1.174.13	0.06242	0.04935	0.04935	0.04682	0.04682	0.04681	0.04681	0.043590
0.03436	0.01561							
865.94580	282.86792	143.57362	92.37343	49.73953	37.72325	35.35821	29.94441	23.80391
18.01707	17.76411	13.88148	12.4978	11.43181	11.26068	11.01901	10.61525	8.75941
8.52678	8.26230	8.20317	8.16558	6.69837	6.53246	6.48177	6.15238	5.18542
4.80876	4.80876	4.80876	4.72275	4.12208	3.55282	2.94884	2.87167	1.68910
1.15259	1.24948	1.13147	1.1147	1.08204	1.06585	1.06585	1.04661	0.99004
4.34547	4.34547	4.34547	4.34547	4.21346	0.72136	0.71056	0.71056	0.63951
0.56845	0.56845	0.56845	0.56303	0.55382	0.53292	0.52362	0.52260	0.42430
0.46136	0.46136	0.46136	0.46136	0.29441	0.28287	0.27691	0.26278	0.24044
0.35528	0.35528	0.31975	0.31975	0.20606	0.16891	0.14211	0.14143	0.09948
0.22629	0.22629	0.22629	0.22629	0.16891	0.14211	0.14143	0.12387	0.05630
4.0 7.719	22.47405	92.38164	90.62103	49.74396	28.02250	23.80303	23.79097	23.59770
1.7 16.566	11.36201	8.76173	8.76173	2.79465	8.52754	8.17386	7.21554	6.70015
1.2 6.507	5.50411	5.51746	5.77987	5.68502	5.15305	5.14979	4.88810	4.12317
1.0 7.244	7.01144	7.02058	3.82058	3.55314	2.96911	2.666532	2.28155	1.40258
1.0 6.821	1.0 6.821	1.0 6.821	1.0 6.821	1.0 6.821	0.89846	0.83154	0.81137	0.71143
0.7 7.743	0.7 7.743	0.7 7.743	0.7 7.743	0.7 7.743	0.67422	0.63957	0.58432	0.56850
0.5 5.325	0.5 5.325	0.5 5.325	0.5 5.325	0.5 5.325	0.48001	0.37483	0.35531	0.30950
0.3 3.294	0.3 3.294	0.3 3.294	0.3 3.294	0.3 3.294	0.22474	0.22001	0.20678	0.19835
0.1 1.008	0.1 1.008	0.1 1.008	0.1 1.008	0.1 1.008	0.14212	0.11237	0.10661	0.09949
6.65116	3.25581	3.13416	2.73378	2.54715	2.13673	1.73155	1.85267	1.74503
1.21623	0.949508	0.93066	0.93066	0.75618	0.73201	0.71152	0.65693	0.60494
0.52101	0.46591	0.39385	0.39385	0.37116	0.37116	0.32418	0.21202	0.16132
0.11052	0.03143	0.07928	0.07928	0.04537	0.04537	0.03277	0.03473	0.02120
0.02121	0.01745							
4.65158	3.25611	2.73412	2.02372	1.21822	1.74518	1.61620	1.54464	1.47180
0.93077	0.81456	0.76765	0.75625	0.69901	0.66899	0.62607	0.60500	0.53353
0.41334	0.31276	0.29436	0.29436	0.26927	0.26756	0.24337	0.13382	0.11053
0.10182	0.08144	0.05004	0.04537	0.03679	0.03312	0.03128	0.02760	0.01745
0.01338	0.01338							

THE HISTORY OF THE AMERICAN MAGNITUDE

WILSON DEVICES CMX ECB - A TWO N

THE VALUES OF A THRUXTON 1 AND 1 THRUXTON 2 LESS THAN 1

PARAMETERS IMMEDIATELY ABOVE VS PENCENT CONFIDENCE LEVEL		1.956-1.996	1.977-1.986	1.997-1.998	2.005-2.006	2.017-2.017	2.022-2.022
5.86-6.4961	4.70-2.4878	3971.59448	265.55054	239.30551	222.29169	217.35172	208.99220
1956-16553	174.61659	172.89368	150.76247	148.19438	137.93478	127.85776	124.27774
203-76226	112.57052	110.68741	101.56735	107.68738	103.56477	99.01955	97.80827
117.36960	112.85571	86.50399	84.16442	81.50691	78.45815	76.41277	70.87558
94-66460	86.50399	86.50399	84.16442	81.50691	78.45815	76.41277	75.11666
69-36758	68.13472	65.40935	60.92046	59.27774	59.17987	50.68497	57.53593
57-53598	56.70645	55.33992	54.92072	52.38510	51.98700	48.06917	48.03037
46-74003	46.57536	46.28748	44.67032	43.34180	43.47034	41.57863	41.42590
40-61163	40.23239	39.65225	39.47734	37.44860	36.67810	34.18295	34.52055
33-96141	33.50275	30.15247	27.16896	27.01689	26.55507	25.84697	25.99119
25-12170	24.85555	24.45206	24.12196	23.38696	23.32539	22.11182	21.26264
20-93822	20.57672	20.30681	20.10165	20.10164	20.10164	19.34286	18.09148
17-70317	17.38894	17.38814	17.21619	16.91402	16.21138	15.70442	15.34293
15-28255	14.48369	14.17512	13.99524	13.97262	13.81674	12.93426	12.56353
12-38014	12.30714	12.18409	11.95635	11.89980	11.76713	11.43957	11.37300
10-61314	10.46465	10.42855	10.31518	9.31518	6.63703	6.61699	6.52806
8-15069	8.12273	7.91478	7.56553	7.56650	7.53812	7.40972	7.33562
7-29913	6.91432	6.76894	6.47260	6.46713	5.95918	5.82192	5.56800
5-33515	5.12797	5.11189	5.02561	5.02541	5.02541	4.84377	4.62343
4-22193	4.23193	4.07535	4.07535	4.06136	4.06136	4.05543	4.01146
3-91011	3.69874	3.55216	3.36798	3.23840	3.11749	2.93434	2.83502
2-63977	4.62925	2.61119	2.53558	2.51271	2.64098	2.44491	2.40429
2-15765	2.03767	1.99163	1.97514	1.95122	1.64937	1.81431	1.74797
1-74115	1.73957	1.67514	1.63985	1.63014	1.67996	1.60721	1.54900
1-52961	1.45925	1.44964	1.42512	1.41340	1.39292	1.35674	1.32422
1-25535	1.246658	1.243688	1.22689	1.19702	1.12760	1.09225	1.06600

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PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL		72.0 .74447	485.3 J957	273.00926	266.94238	256.67554	240.24832	234.65744	214.50742	182.00642
6.61 40.6	6.59 40.6	6.53 39.8	6.45 39.4	6.42 39.0	6.42 39.6	6.42 39.0	6.41 36.5	7.40 36.1	7.36 35.7	7.30 35.3
7.57 37.6	7.54 37.3	7.54 36.9	7.54 36.5	7.54 36.1	7.54 35.7	7.54 33.3	5.96 33.3	5.82 32.9	5.74 32.5	5.62 32.3
6.95 34.9	6.77 34.5	6.47 34.1	6.47 33.7	6.47 33.3	6.47 33.0	5.13 30.9	5.11 30.5	5.03 30.1	5.03 29.7	5.03 29.7
5.58 32.1	5.57 31.7	5.34 31.3	5.34 30.9	5.34 30.5	5.34 30.1	4.57 28.1	4.56 27.7	4.25 27.3	4.23 26.9	4.23 26.9
5.03 29.3	4.84 28.9	4.62 28.5	4.62 28.1	4.62 27.7	4.62 27.3	4.06 25.3	4.06 24.9	4.01 24.5	4.01 24.1	4.01 24.1
4.08 26.5	4.08 26.1	4.06 25.7	4.06 25.3	4.06 24.9	4.06 24.5	3.70 22.9	3.45 22.5	3.37 22.1	3.24 21.7	3.12 21.3
3.91 23.7	3.91 23.3	3.70 22.9	3.70 22.5	3.70 22.1	3.70 21.7	2.68 20.5	2.68 20.1	2.65 19.7	2.64 19.3	2.61 18.5
2.93 20.9	2.93 20.5	2.68 20.1	2.68 20.1	2.68 20.1	2.68 20.1	2.51 17.7	2.44 17.3	2.44 16.9	2.40 16.5	2.31 15.7
2.53 18.1	2.53 17.7	2.44 17.3	2.44 17.3	2.44 17.3	2.44 17.3	1.99 14.5	1.98 14.1	1.95 13.7	1.85 13.3	1.81 12.9
2.15 15.3	2.04 14.9	1.99 14.5	1.99 14.1	1.99 14.1	1.99 14.1	1.75 12.2	1.75 11.6	1.74 11.2	1.68 10.8	1.64 10.0
1.81 12.4	1.75 12.2	1.75 11.6	1.75 11.2	1.75 11.2	1.75 11.2	1.61 9.2	1.61 8.8	1.55 8.4	1.55 8.0	1.53 7.2
1.63 9.6	1.63 9.2	1.61 8.8	1.61 8.4	1.61 8.4	1.61 8.4	1.45 6.4	1.45 6.0	1.41 5.6	1.36 5.2	1.32 4.4
1.46 6.8	1.32 4.5	1.30 3.6	1.26 3.2	1.25 2.8	1.25 2.4	1.39 0.6	1.39 0.6	1.39 0.6	1.39 0.6	1.20 1.6
1.13 1.2	1.07 0.6	1.07 0.4	1.07 0.4	1.07 0.4	1.07 0.4	0.6	0.6	0.6	0.6	0.0
80										
16.9 40.96	14.1 39.6	13.6 36.6	13.6 36.3	13.6 36.3	13.6 36.3	11.5 34.6	11.5 34.3	11.5 34.3	11.5 34.3	11.5 34.3
11.5 32.00	11.5 32.0	11.5 32.0	11.5 32.0	11.5 32.0	11.5 32.0	9.5 28.5	9.5 28.5	9.5 28.5	9.5 28.5	9.5 28.5
8.2 51204	7.6 22440	7.5 22145	7.3 91707	7.2 80552	7.2 80552	5.9 32.5	5.9 32.2	5.9 32.2	5.9 32.2	5.9 32.2
6.3 52034	5.9 32.5	5.7 20198	5.7 16832	5.6 85227	5.6 85227	4.5 30.5	4.5 30.2	4.5 30.2	4.5 30.2	4.5 30.2
4.5 73665	4.5 50157	4.5 50157	4.4 36788	4.3 55679	4.3 55679	3.3 36781	3.2 85252	3.2 85252	3.2 85252	3.2 85252
35.4 40116	33.3 36783	33.3 36781	32.8 3104	29.8 2693	29.8 2693	26.6 926	26.6 880	26.6 880	26.6 880	26.6 880
27.4 4078	26.6 926	26.6 880	26.1 13394	25.3 34297	25.3 34297	21.3 3541	19.7 1121	19.7 1121	19.7 1121	19.7 1121
21.3 3541	20.5 3452	20.5 3452	19.7 1121	19.7 1121	19.7 1121	17.4 7926	17.4 7926	17.4 7926	17.4 7926	17.4 7926
18.4 7926	17.4 7926	17.4 7926	16.9 66669	15.89 16	15.89 16	13.19046	13.11916	12.99279	12.31952	11.19956
16.0 961	13.19046	13.11916	12.99279	12.31952	12.31952	9.16032	8.49121	8.44766	8.16690	7.62244
9.16032	8.96758	8.52059	8.49121	8.44766	8.44766	7.3971	7.14660	6.95223	6.14713	5.69507
7.3971	7.14660	6.99276	6.99276	6.49328	6.49328	5.0517	4.92817	4.92780	4.92780	4.92780
5.0517	5.0517	4.92817	4.92817	4.92780	4.92780	4.46788	4.31615	3.67336	3.24615	3.24615
4.46788	2.70573	2.66291	2.62843	2.50259	2.50259	2.70573	2.66291	2.62843	2.59350	2.59350
2.70573	2.66291	2.62843	2.62843	2.62843	2.62843	2.02192	1.85024	1.77564	1.71012	1.64260
2.02192	2.0207	1.85024	1.85024	1.85024	1.85024	1.39744	1.33195	1.33195	1.32685	1.31087
1.39744	1.33195	1.33195	1.33195	1.33195	1.33195	72.0 .74 99.6	468.31 98.9	29.3.17 98.9	273.01 97.8	266.94 97.2
234.66 95.6	214.51 95.0	182.01 94.4	169.41 93.9	169.41 93.9	169.41 93.9	137.2 91.7	135.99 91.1	124.28 90.6	122.35 90.0	120.34 89.4
137.2 91.7	135.99 91.1	135.99 91.1	105.60 87.2	95.56 86.7	95.56 86.7	114.34 87.6	85.19 83.3	82.51 82.8	76.22 82.2	75.22 81.7
87.5 83.9	85.19 83.3	85.19 83.3	82.51 82.8	82.51 82.8	82.51 82.8	72.21 80.5	72.21 79.4	72.21 78.9	72.21 78.3	72.21 78.3
57.2 76.1	57.17 75.6	56.86 75.6	56.86 75.6	56.86 75.6	56.86 75.6	50.87 75.6	49.55 75.6	48.23 75.6	47.91 75.6	47.59 75.6
45.73 72.2	45.73 71.7	45.50 71.1	45.05 70.6	44.86 70.1	44.86 70.1	41.97 67.8	41.71 66.7	39.48 66.1	35.48 65.6	31.87 65.0
43.48 68.3	42.40 67.8	41.92 67.2	41.71 66.7	41.71 66.7	41.71 66.7	30.03 64.9	29.57 63.3	29.57 62.8	29.32 62.2	28.76 61.7
32.85 64.4	30.03 64.9	29.57 63.3	29.57 63.3	29.57 63.3	29.57 63.3	27.44 60.6	26.47 59.4	26.11 58.9	25.75 58.3	25.03 57.2
27.44 60.6	26.69 60.0	26.47 59.4	26.47 59.4	26.47 59.4	26.47 59.4	22.42 56.1	21.63 55.6	21.36 55.1	20.53 54.6	19.71 53.9
23.65 56.7	22.42 56.1	21.63 55.6	21.36 55.1	21.36 55.1	21.36 55.1	19.71 52.2	19.54 51.7	19.21 51.1	18.77 50.6	18.48 49.4
19.71 52.2	17.75 48.3	16.97 47.8	15.90 47.2	15.90 47.2	15.90 47.2	14.12 45.4	14.05 43.9	13.19 43.3	12.40 42.8	11.50 41.7
17.75 48.3	16.97 47.8	15.90 47.2	15.90 47.2	15.90 47.2	15.90 47.2	11.21 41.1	10.01 40.0	9.86 39.4	9.37 38.9	9.10 38.3
9.86 39.4	8.49 36.7	8.49 36.1	8.49 36.1	8.49 36.1	8.49 36.1	7.15 32.8	5.10 28.3	5.03 27.8	5.01 27.2	5.01 26.7
5.10 28.3	5.03 27.8	5.03 27.8	4.93 24.4	4.93 24.4	4.93 24.4	4.80 23.9	4.80 23.9	4.75 23.3	4.63 22.8	4.48 22.2
4.93 24.4	4.43 21.1	4.43 20.6	4.43 20.6	4.43 20.6	4.43 20.6	3.46 19.4	3.46 19.4	3.46 19.4	3.24 18.3	3.24 18.3

3.18	17.8	2.84	17.2	2.79	16.7	2.71	16.1	2.66	15.6	2.63	15.0	2.50	14.4
2.46	13.9	2.39	13.3	2.21	12.8	2.19	12.2	2.18	11.7	2.15	11.1	2.11	10.6
2.00	10.0	1.85	9.4	1.78	8.9	1.71	8.3	1.66	7.8	1.64	7.2	1.64	6.7
1.53	6.1	1.45	5.6	1.42	5.0	1.40	4.4	1.38	3.9	1.33	3.3	1.33	2.8
1.31	2.2	1.27	1.7	1.21	1.1	1.08	0.6	1.01	0.0				

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL													
791.90	98.6	343.02	97.1	158.40	95.7	85.54	94.2	82.49	92.8	69.99	91.3	58.67	89.9
57.17	88.4	44.70	87.0	42.24	85.5	41.92	84.1	40.02	82.6	33.54	81.2	33.00	79.7
33.44	78.3	29.59	76.8	26.40	75.6	25.15	73.9	22.95	72.5	22.95	71.0	21.12	69.6
20.31	68.1	18.48	66.7	17.60	65.2	14.72	63.8	12.93	62.3	12.49	60.9	11.18	59.4
10.66	58.0	8.88	56.5	8.38	55.1	8.12	53.6	6.03	52.2	5.74	50.7	5.66	49.3
5.61	47.8	4.60	46.4	4.45	44.9	4.30	43.5	4.04	42.0	3.77	40.6	3.49	39.1
3.03	37.7	2.97	36.2	2.97	34.8	2.96	33.3	2.95	31.9	2.70	30.4	2.52	29.0
2.45	27.5	2.36	26.1	2.36	24.6	2.12	23.2	2.19	21.7	1.95	20.3	1.94	18.8
1.63	17.4	1.82	15.9	1.62	14.5	1.52	13.0	1.49	11.6	1.45	10.1	1.41	8.7
1.39	7.2	1.35	5.8	1.32	4.3	1.12	2.9	1.07	1.4	1.06	0.0		

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL														
727.52051	143.93538	82.67279	80.83562	78.59019	64.30106	63.42088	51.12602	50.89406	30.31335	29.77527	21.08754	19.55699	13.26333	
49.87672	47.36977	41.10047	36.91898	38.14112	37.99892	36.51660	31.66577	30.31335						
28.41876	28.46044	26.38814	25.56302	25.14792	23.09212	21.44269	21.08754	21.08754						
19.17	17.51	18.46269	17.62967	17.3191	16.79245	16.12311	15.83289	15.16847						
12.66631	12.27025	10.55526	10.51517	10.10445	9.19297	9.19401	8.52101	8.11933						
7.90764	7.46338	7.62380	7.69997	6.81661	6.81660	6.81660	6.55462	6.46685						
5.96671	5.92122	5.68375	5.27763	5.21889	5.19658	5.13437	5.05277	4.73942						
4.44596	4.32688	4.27916	4.2977	4.22210	4.10749	4.00081	3.95392	3.72336						
3.66791	3.59838	3.40840	3.32512	3.20965	3.03133	2.99377	2.93392	2.81481						
2.55633	2.55633	2.49691	2.48359	2.37014	2.26184	2.16524	2.11139	2.08635						
2.03619	1.97911	1.94766	1.76035	1.70420	1.69516	1.68701	1.67616	1.64944						
1.64847	1.64216	1.64215	1.54514	1.53948	1.51567	1.49235	1.43512	1.37372						
1.29190	1.24179	1.26179	1.22109	1.17357	1.16329	1.11458	1.05553	1.05438						

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL

727.52051	143.93538	82.67279	80.83562	78.59019	64.30106	63.42088	51.12602	50.89406	30.31335	29.77527	21.08754	19.55699	13.26333
727.525616	143.93538	82.67279	80.83562	78.59019	64.30106	63.42088	51.12602	50.89406	30.31335	29.77527	21.08754	19.55699	13.26333
63.42	93.9	51.13	93.2	50.89	92.4	49.68	91.7	47.37	90.9	41.18	90.2	38.92	89.4
38.14	88.6	38.14	87.9	36.52	87.1	31.67	86.4	31.31	85.6	29.78	84.8	28.62	84.1
28.64	83.3	26.39	82.6	25.56	81.8	25.15	81.1	23.09	80.3	21.46	79.5	21.09	78.8
21.9	7.9	19.56	77.3	19.07	76.5	18.43	75.8	17.63	75.0	17.59	74.2	17.32	73.5
16.79	72.7	16.02	72.0	15.83	71.2	15.15	70.5	13.26	69.7	12.67	68.9	12.27	68.2
12.56	67.4	11.52	66.7	10.11	65.9	9.49	65.2	9.09	64.4	8.52	63.6	8.12	62.9
7.98	62.1	7.91	61.4	7.86	60.6	7.82	59.6	7.70	59.1	6.82	58.3	6.82	57.6
6.62	56.8	6.55	56.1	6.47	55.3	6.39	54.5	5.96	53.8	5.92	53.0	5.68	52.3
5.28	51.5	5.27	50.8	5.20	50.0	5.13	49.2	5.05	48.5	4.74	47.7	4.69	47.0
4.45	46.2	4.47	45.5	4.35	44.7	4.28	43.9	4.23	43.2	4.22	42.4	4.14	41.7
4.00	40.9	3.95	40.2	3.73	39.4	3.67	38.6	3.60	37.9	3.41	37.1	3.33	36.4

APPENDIX A

3.21	35.6	3.07	34.6	2.99	34.1	2.93	33.3	2.81	32.6	2.73	31.8
2.56	30.3	2.49	29.5	2.48	28.9	2.35	28.0	2.26	27.3	2.17	26.5
2.09	25.0	2.07	24.2	2.03	23.5	1.98	22.7	1.95	22.0	1.76	21.2
1.71	19.7	1.71	18.9	1.69	18.2	1.68	17.4	1.65	16.7	1.66	15.2
1.64	14.4	1.55	13.6	1.56	12.9	1.52	12.1	1.49	11.4	1.44	10.6
1.32	9.1	1.29	8.3	1.24	7.6	1.22	6.8	1.17	5.3	1.17	4.8
1.13	3.4	1.11	3.0	1.06	2.3	1.05	1.5	1.02	0.8	1.16	0.5

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL											
237.23941											
90.58205	89.46336	87.86639	69.26862	59.62102	58.34615	55.49240	45.59254	44.76213	41.2691	39.00497	37.26594
32.63686	30.89053	27.0370	25.79674	22.52560	21.25800	21.24437	20.10803	19.72691	19.72691	19.72691	19.72691
15.90043	15.53787	14.2095	14.07564	13.9460	13.51536	10.81229	10.81229	10.81229	10.81229	10.81229	10.81229
9.70733	9.67378	9.35232	9.32662	9.21174	8.60734	8.59563	8.54112	7.45970	7.26594	7.26594	7.26594
7.02931	6.93655	6.93095	6.75330	6.66045	6.17811	5.32836	4.83265	4.50512	4.04655	3.07167	3.07167
3.98250	3.75789	3.75350	3.65280	3.51891	3.50712	3.29499	3.19701	1.93077	1.87675	1.68942	1.68942
3.05963	2.91335	2.47344	2.1934	2.12006	1.96358	1.93114	1.93114	1.93114	1.93114	1.93114	1.93114
1.64749	1.62215	1.60925	1.51746	1.51343	1.47756	1.47756	1.47756	1.47756	1.47756	1.47756	1.47756
1.14608	1.10562	1.07020	1.06695	1.06567	1.06567	1.06567	1.06567	1.06567	1.06567	1.06567	1.06567
237.24 90.9	90.58 97.7	89.46 96.6	87.87 95.4	69.27 94.3	59.62 93.1	59.62 93.1	59.62 93.1	59.62 93.1	59.62 93.1	59.62 93.1	59.62 93.1
55.49 90.6	45.59 89.7	44.76 88.5	36.63 87.4	32.44 86.4	30.89 85.1	30.89 85.1	30.89 85.1	30.89 85.1	30.89 85.1	30.89 85.1	30.89 85.1
25.80 82.8	22.53 81.6	21.26 80.5	21.24 79.3	20.11 78.2	19.73 77.0	19.73 77.0	19.73 77.0	19.73 77.0	19.73 77.0	19.73 77.0	19.73 77.0
15.90 74.7	15.54 73.6	14.21 72.4	14.08 71.3	13.98 70.1	13.52 69.0	13.52 69.0	13.52 69.0	13.52 69.0	13.52 69.0	13.52 69.0	13.52 69.0
10.81 66.7	9.88 65.5	9.71 64.4	9.67 63.2	9.55 62.1	9.32 60.9	9.32 60.9	9.32 60.9	9.32 60.9	9.32 60.9	9.32 60.9	9.32 60.9
8.61 58.6	8.01 57.5	8.34 56.3	7.46 55.2	7.27 54.0	7.03 52.9	7.03 52.9	7.03 52.9	7.03 52.9	7.03 52.9	7.03 52.9	7.03 52.9
6.93 50.6	6.76 49.4	6.66 48.3	6.18 47.1	5.33 46.0	4.83 44.8	4.83 44.8	4.83 44.8	4.83 44.8	4.83 44.8	4.83 44.8	4.83 44.8
4.05 42.5	4.05 41.4	3.98 41.4	3.76 40.2	3.75 39.1	3.75 37.9	3.65 36.8	3.52 35.6	3.52 35.6	3.52 35.6	3.52 35.6	3.52 35.6
3.51 34.5	3.29 33.3	3.20 32.2	3.07 31.0	3.06 29.9	2.91 28.7	2.91 28.7	2.91 28.7	2.91 28.7	2.91 28.7	2.91 28.7	2.91 28.7
2.13 26.4	2.12 25.3	1.96 24.1	1.93 23.3	1.93 23.3	1.93 23.3	1.93 23.3	1.93 23.3	1.93 23.3	1.93 23.3	1.93 23.3	1.93 23.3
1.65 18.4	1.62 17.2	1.61 16.1	1.52 14.9	1.51 13.9	1.41 12.6	1.41 12.6	1.41 12.6	1.41 12.6	1.41 12.6	1.41 12.6	1.41 12.6
1.31 16.3	1.21 9.2	1.18 8.0	1.15 6.9	1.11 5.7	1.07 4.6	1.07 4.6	1.07 4.6	1.07 4.6	1.07 4.6	1.07 4.6	1.07 4.6
1.07 2.3	1.07 1.1	1.06 0.0	1.06 0.0	1.06 0.0	1.06 0.0	1.06 0.0	1.06 0.0	1.06 0.0	1.06 0.0	1.06 0.0	1.06 0.0

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL											
482.32471											
223.57544	140.15243	52.10298	42.62571	27.57031	26.31712	26.16864	23.35890	20.04686	20.04686	20.04686	20.04686
16.99905	16.68712	17.98338	16.56210	16.35523	13.98043	13.91043	9.17362	7.3209	6.61688	6.61688	6.61688
5.03842	5.33918	3.93613	3.49511	3.46518	3.35367	3.2408	2.80621	2.62133	2.32209	2.32209	2.32209
2.12790	1.94614	1.80872	1.77238	1.65422	1.62249	1.61716	1.55083	1.53549	1.53549	1.53549	1.53549
1.31394	1.28345	1.21296	1.16794	1.04783							
482.32 97.8	223.57 95.6	140.15 93.3	52.10 91.1	42.62 88.9	27.57 86.7	26.16 86.4	23.35 86.4	20.04 86.4	20.04 86.4	20.04 86.4	20.04 86.4
24.17 82.2	23.36 80.0	20.10 77.8	19.00 75.6	18.69 73.3	17.97 71.1	16.54 68.9	16.54 68.9	16.54 68.9	16.54 68.9	16.54 68.9	16.54 68.9
16.35 66.7	13.98 64.4	13.98 62.2	9.17 60.0	7.35 57.8	6.62 55.6	5.84 53.3	5.84 53.3	5.84 53.3	5.84 53.3	5.84 53.3	5.84 53.3
5.34 51.1	3.93 48.9	3.52 46.7	3.45 44.4	3.35 42.2	3.22 40.0	2.80 37.8	2.80 37.8	2.80 37.8	2.80 37.8	2.80 37.8	2.80 37.8
2.62 35.6	2.32 33.3	2.13 31.1	1.95 28.9	1.81 26.7	1.77 24.4	1.65 22.2	1.65 22.2	1.65 22.2	1.65 22.2	1.65 22.2	1.65 22.2
1.62 20.0	1.62 17.8	1.55 15.6	1.44 13.3	1.35 11.1	1.31 8.9	1.28 6.7	1.28 6.7	1.28 6.7	1.28 6.7	1.28 6.7	1.28 6.7
1.21 4.6	1.17 2.2	1.17 2.2	1.05 0.0	1.05 0.0	1.05 0.0	1.05 0.0	1.05 0.0	1.05 0.0	1.05 0.0	1.05 0.0	1.05 0.0

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL											
365.37231											
351.51054	351.46631	148.99133	137.07204	131.01691	184.14784	172.94226	169.22473	164.41772	164.41772	164.41772	164.41772
153.45657	153.45657										

APPENDIX A

		PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL			
91.38132	48.53259	88.07243	86.57178	86.47110	83.14532
76.15112	71.37508	68.53600	67.70139	67.55556	61.3274
52.21790	51.38266	51.15213	50.25974	46.48964	46.03694
30.67206	3C.21921	30.02469	27.62216	26.67943	24.75104
11.83664	11.96316	10.7074	10.11359	9.71622	9.13864
7.36946	7.46128	6.55064	5.21287	4.42344	4.22573
3.60296	3.54753	3.15168	3.26478	2.62590	2.55761
1.044118	1.36789	1.22765	1.18E30	1.17349	1.14039
365.37 99.0	351.51 98.0	351.47 97.0	196.53 96.0	184.77 94.9	184.15 93.9
169.22 91.9	166.42 90.9	164.42 89.9	154.41 88.9	153.46 87.9	148.99 86.9
131.02 84.8	128.46 83.8	121.95 82.8	115.05 81.8	114.3 80.8	99.77 79.8
9.18 77.8	86.53 76.8	88.07 75.8	86.57 74.7	86.47 73.7	83.15 72.7
79.37 70.7	78.33 69.7	76.15 68.7	73.39 67.7	71.36 66.7	68.54 65.7
67.56 63.6	61.33 62.6	57.11 61.6	54.83 60.6	53.75 59.6	52.22 58.6
51.15 56.6	50.26 55.6	46.49 54.5	46.04 53.5	39.46 52.5	33.74 51.5
31.79 49.5	30.87 48.5	30.52 47.5	30.02 46.5	27.62 45.5	26.68 44.4
24.62 42.4	19.22 41.4	15.37 40.4	14.41 39.4	11.84 38.4	10.94 37.4
18.11 35.4	9.71 34.3	9.16 33.3	8.53 32.3	7.83 31.3	7.67 30.3
7.37 28.3	7.16 27.3	6.55 26.3	5.31 25.3	4.42 24.2	4.24 23.2
3.84 21.2	3.73 20.2	3.60 19.2	3.60 18.2	3.55 17.2	3.15 16.2
2.63 14.1	2.56 13.1	1.80 12.1	1.74 11.1	1.53 10.1	1.45 9.1
1.37 7.1	1.23 6.1	1.19 5.1	1.17 4.0	1.14 3.0	1.11 2.0
1.13 C.J					1.10 1.0

		PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL			
93.53462	90.81313	66.78993	47.19267	24.73700	19.25713
12.88221	9.58228	6.98666	8.90533	8.87951	8.5281
7.13699	6.86439	6.65963	5.96971	5.46224	5.19288
2.80296	2.76954	2.69600	2.60275	2.54529	2.54438
1.69550	1.53912	1.45879	1.38019	1.29136	1.27635
124.63 97.9	93.53 95.8	90.81 93.8	66.79 91.7	47.19 89.6	26.74 87.5
19.25 83.3	16.55 81.3	17.81 79.2	15.14 77.1	12.98 75.0	9.58 72.9
8.91 68.8	8.88 66.7	8.57 64.6	8.01 62.5	7.91 60.4	7.63 58.3
6.86 54.2	6.66 52.1	5.97 50.0	5.45 47.9	5.19 45.8	5.19 43.8
3.29 39.4	2.96 37.5	2.80 35.4	2.77 33.3	2.77 31.3	2.60 29.2
2.54 25.0	2.35 22.9	2.22 20.8	2.15 18.8	2.12 16.7	1.68 14.4
1.46 10.4	1.31 8.3	1.29 6.3	1.28 4.2	1.27 2.1	1.11 0.0

		PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL			
885.95264	328.13062	177.10061	167.16096	114.88268	106.99916
55.93138	55.372.4	41.01634	38.29422	36.91470	32.09975
24.08441	23.83669	23.9388	23.83694	22.16101	21.85516
16.83386	16.36515	15.95533	12.93724	12.87004	12.30490
10.72753	10.72753	10.72753	10.05706	8.3088	6.90781
5.98367	5.97635	5.36377	5.28245	4.97763	4.89295
4.02282	4.02282	3.98445	2.75434	3.01166	2.71251
2.58495	2.54231	2.49807	2.31577	2.34020	1.8C371
1.566643					1.43190
885.95 96.6	326.13 97.5	177.19 96.3	167.16 95.1	114.88 93.8	107.00 92.6
79.78 90.1	72.92 88.9	70.31 87.7	55.93 86.4	55.37 85.2	41.02 84.0
36.91 81.5	32.11 80.2	31.69 79.0	30.76 77.8	24.97 76.5	24.55 75.3

APPENDIX A

4.18	72.8	23.93	71.6	23.84	71.4	23.07	69.1	22.16	67.9	20.86	66.7	19.31	65.4
8.77	64.2	18.45	63.0	16.83	61.7	16.37	60.5	15.96	59.3	12.94	58.0	12.87	56.8
2.87	55.6	12.07	54.3	11.82	53.1	11.43	51.9	10.88	50.6	10.73	49.4	10.73	48.1
16.36	45.7	10.73	46.9	10.36	45.7	10.00	44.5	9.64	43.2	6.70	40.7	6.26	39.5
5.98	37.1	5.98	37.1	5.91	35.8	5.36	34.6	5.28	33.3	4.97	32.1	4.89	30.9
4.28	26.4	4.27	27.2	4.05	25.9	4.02	24.7	4.02	23.5	3.96	22.2	3.96	22.2
3.49	19.8	3.49	19.8	3.01	18.5	2.71	17.3	2.68	16.0	2.64	14.8	2.60	13.6
2.54	11.1	2.54	11.1	2.44	9.9	2.43	8.6	2.34	7.4	1.80	6.2	1.43	4.9
2.58	12.3	1.31	3.7	1.15	2.5	1.08	1.2	1.07	0.0				

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL				20-30 84.8			
				51.07	87.9	6.98	63.6
72.94	97.1	64.16	93.9	6.2-10	90.9	9.28	66.7
14.50	75.8	12.84	72.7	10.09	69.7	3.61	45.5
4.91	54.5	4.82	51.5	3.81	48.5	3.57	42.4
3.21	33.3	2.91	30.3	2.74	27.3	1.97	21.2
1.52	12.1	1.43	9.1	1.28	6.1	1.75	18.2
						1.02	0.0

1.293-0.2979	408-92798	129.32578	34.-77586	29.-24849	23.-12093	21.-35901	20.-62137	19.-44956	19.-08154
1.6-75563	16.-19331	14.-14276	13.-23296	11.-59400	10.-25745	9.-26303	8.-91684	8.-35863	8.-91498
18.-90519	18.-35334	17.-35187	17.-39658	17.-34653	16.-73626	16.-65792	15.-92027	5.-81498	5.-81498
5.-55563	5.-47421	5.-29977	5.-28651	5.-98651	4.-91271	4.-68527	4.-38727	4.-13261	4.-13261
3.-67078	3.-30155	2.-18402	2.-82383	2.-54465	2.-42220	2.-39030	2.-30324	2.-29408	2.-29408
2.-27686	2.-422286	2.-17802	2.-04197	1.-93198	1.-87199	1.-78011	1.-77867	1.-77867	1.-77867
1.-67586	1.-57619	1.-40635	1.-39921	1.-3981	1.-39693	1.-39781	1.-35731	1.-33177	1.-13986
							1.-10650	1.-04891	1.-00018

1000000 PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL					
1.293e-02	98.8	408.3	97.5	129.33	96.3
2. -62	91.1	19.5	68.9	1.18	87.7
1.3-23	91.5	11.59	80.2	10.26	79.0
6.35	78.8	7.4	71.6	7.35	70.4
5.92	64.2	5.81	63.3	5.56	61.7
4.91	55.6	4.65	54.3	4.63	53.1
3.18	46.9	2.82	45.7	2.54	44.4
2.29	38.3	2.28	37.4	2.21	35.6
1.7	28.6	1.7	28.4	1.78	27.2
				1.69	25.9
				1.68	24.7
				1.58	23.5
				21.36	91.4
				14.14	82.7
				16.09	84.0
				16.76	85.2
				8.86	75.3
				6.35	74.1
				6.66	66.7
				6.2	65.4
				4.99	56.8
				3.30	48.1
				3.67	49.4
				2.37	40.7
				2.39	42.0
				2.04	33.3
				1.93	32.1
				1.87	30.9
				1.40	22.2

1.40	21.0	1.40	19.8	1.40	17.3	1.33	14.9
1.13	12.3	1.13	11.1	1.13	9.9	1.11	8.6
1.04	3.7	1.00	2.5	1.00	1.2	1.00	0.9

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL							
1293.03	99.	129.33	96.9	34.78	95.8	29.25	94.8
20.62	91.7	19.50	90.6	19.08	89.6	18.90	88.5
14.50	84.4	14.14	83.3	13.23	82.3	12.94	81.3
9.28	77.1	9.26	76.0	8.92	75.0	8.36	74.0
7.35	69.8	7.31	68.8	6.85	67.7	6.74	66.7
5.81	62.5	5.56	61.5	5.47	60.4	5.30	59.4
4.69	55.2	4.63	54.2	4.39	53.1	4.13	52.1
3.30	47.9	3.28	46.9	3.18	45.9	2.82	44.9
2.39	40.6	2.37	39.6	2.35	38.5	2.30	37.5
2.18	33.3	2.04	32.3	1.97	31.3	1.93	30.2
1.78	26.1	1.69	25.1	1.68	24.0	1.58	22.9
1.40	16.8	1.40	17.7	1.40	16.7	1.40	15.6
1.14	11.5	1.13	11.4	1.13	9.4	1.13	8.3
1.05	4.2	1.04	3.1	1.00	2.1	1.00	1.0

1.40	17.3	2.9-24849	23-12093	21-3501	20-62137	19-9556	19-08154
18.90089	16.33365	16.75563	16.09331	14.49531	14.14206	13.2226	12.84336
10.08229	9.28408	9.26303	8.91684	8.3563	8.3534	8.35187	7.39658
6.45100	6.73626	6.65792	6.21581	5.92027	5.81498	5.5653	5.47421
4.98601	4.91271	4.68527	4.63233	4.38277	4.13261	3.67078	3.61499
3.27550	3.18412	2.82383	2.74416	2.54465	2.42220	2.39330	2.36520
2.29408	2.27664	2.17827	2.20286	2.04197	1.96826	1.93198	1.87199
1.77867	1.68941	1.67586	1.57619	1.52161	1.42916	1.40435	1.39806
1.39693	1.35731	1.33177	1.21057	1.13886	1.12968	1.12877	1.10740
1.10651	1.04691	1.03539	1.03016	1.00018	1.00000	1.00000	1.00000

1293.038013	267.27861	190.15332	154.32256	152.59288	122.91597	100.79106	83.99255
57.34596	53.2429C	49.86566	45.81412	44.36916	43.62220	43.62220	40.12386
47.12366	39.93217	37.34621	33.59702	33.59702	33.03847	32.59769	27.53943
27.53206	26.74922	26.62144	25.29985	25.07741	23.60226	23.60226	23.48952
22.42144	22.29102	22.29102	21.44490	21.11781	20.41803	20.15820	20.04192
20.00192	19.38289	19.10658	19.01718	18.86195	18.35471	17.74763	16.03673
15.92289	15.74861	14.30456	13.91037	13.37462	13.10773	12.88137	12.73774
12.26338	11.71989	11.58208	11.40920	11.16092	10.83775	10.64858	10.07911
9.93354	9.47625	9.17736	9.16262	9.11906	8.87382	8.76486	8.40677
8.39926	8.35914	8.29927	8.15436	8.15436	8.07477	7.98644	7.98644
7.98644	7.71613	7.71613	7.57054	7.54479	7.46601	7.44563	7.19936
6.74755	6.71535	6.64741	6.66770	6.60770	6.47813	6.47286	6.31750
6.31751	6.29944	6.23568	6.23071	6.14760	5.92889	5.75949	5.59950
5.57276	5.53204	5.42214	5.32429	5.27666	5.23379	5.21194	5.14551
5.14408	5.11548	4.99152	4.94983	4.88192	4.88026	4.79668	4.71978
4.71918	4.58141	4.38222	4.38222	4.19461	4.12981	4.00679	3.99322
3.9523	3.9346	3.80112	3.80112	3.80306	3.77239	3.65750	3.61478
3.60338	3.60838	3.37331	3.35910	3.25746	3.1788	3.13031	3.04605
3.02677	3.1375	3.30869	2.97825	2.97214	2.87974	2.86598	2.77910
2.74151	2.54125	2.51978	2.50774	2.42142	2.39979	2.37755	2.36023
2.35989	2.35989	2.31442	2.28195	2.28184	2.18402	2.08477	2.01582
1.98830	1.9689C	1.95126	1.87818	1.78322	1.68690	1.61266	1.61266

APPENDIX A

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL		1.57348	1.57326	1.53565	1.50255	1.45208	1.44552						
330.36	99.6	307.38	99.2	267.28	98.8	190.15	98.4	154.32	98.0	152.59	97.6	122.92	97.2
100.79	96.8	83.99	96.4	60.79	96.0	43.82	93.2	43.82	92.5	53.24	95.2	49.85	94.8
65.01	94.0	64.37	93.5	43.82	93.2	43.82	92.5	40.12	92.4	40.12	92.0	45.81	94.4
39.93	91.2	37.15	90.8	37.15	90.4	33.60	90.0	33.60	89.6	33.60	89.2	33.60	88.8
32.60	88.6	27.54	88.1	27.53	87.6	26.75	87.1	26.62	86.7	25.30	86.3	25.08	85.9
25.08	85.5	23.60	85.1	23.60	84.6	23.60	84.3	23.49	83.9	22.43	83.5	22.29	83.1
10.65	66.7	10.06	68.3	10.06	67.9	21.12	81.5	20.48	81.1	20.16	80.7	20.16	80.3
22.29	82.7	22.29	82.3	21.44	81.9	19.11	78.7	19.02	78.3	18.86	77.9	18.35	77.5
20.06	79.9	20.06	79.5	19.38	79.1	19.11	78.7	19.02	78.3	18.86	77.9	18.35	77.5
17.75	77.1	17.37	76.7	16.28	76.3	16.04	75.9	15.97	75.5	15.75	75.1	14.36	74.7
13.91	74.3	13.39	73.9	13.37	73.5	13.31	73.1	12.98	72.7	12.76	72.3	12.74	71.9
12.26	71.5	11.12	71.1	11.58	70.7	11.41	70.3	11.41	69.9	10.84	69.5	10.65	69.1
6.32	51.8	6.32	51.4	6.30	51.0	6.30	50.6	6.24	50.2	6.23	49.8	6.16	46.3
5.93	46.0	5.76	48.6	5.73	48.2	5.63	47.8	5.57	47.4	5.53	47.0	5.42	46.6
5.32	46.2	5.32	45.8	5.28	45.4	5.23	45.0	5.21	44.6	5.15	44.2	5.15	43.8
5.14	43.4	5.02	43.0	5.02	42.6	4.99	42.2	4.95	41.8	4.88	41.4	4.84	41.0
6.80	40.6	6.72	40.2	6.72	39.8	6.72	39.4	6.58	39.0	6.38	38.6	6.38	38.2
4.38	37.8	4.19	37.3	4.15	36.9	4.13	36.5	4.01	36.1	3.99	35.7	3.95	35.3
3.93	34.9	3.86	34.5	3.84	34.1	3.81	33.7	3.80	33.3	3.77	32.9	3.66	32.5
3.63	32.1	3.61	31.7	3.61	31.3	3.61	30.9	3.58	30.5	3.57	30.1	3.36	29.7
3.26	29.3	3.17	28.9	3.13	28.5	3.07	28.1	3.05	27.7	3.03	27.3	3.01	26.9
3.01	26.5	2.98	26.1	2.97	25.7	2.94	25.3	2.88	24.9	2.87	24.5	2.78	24.1
2.77	23.7	2.74	23.3	2.74	22.9	2.52	22.5	2.51	22.1	2.42	21.7	2.36	21.3
2.44	20.9	2.40	20.5	2.37	20.1	2.36	19.7	2.36	19.3	2.36	18.9	2.36	18.5
2.32	18.1	2.28	17.7	2.28	17.3	2.18	16.9	2.08	16.5	2.02	16.1	1.99	15.7
1.98	15.3	1.97	14.9	1.96	14.5	1.92	14.1	1.88	13.7	1.76	13.3	1.71	12.9
1.69	12.4	1.65	12.0	1.61	11.6	1.61	11.2	1.60	10.8	1.60	10.4	1.57	10.0
1.57	9.6	1.54	9.2	1.54	8.8	1.57	8.4	1.45	8.0	1.45	7.6	1.44	7.2
1.43	6.8	1.39	6.4	1.39	6.0	1.38	5.6	1.38	5.2	1.34	4.8	1.33	4.4
1.23	4.7	1.22	3.6	1.18	3.2	1.16	2.8	1.10	2.4	1.08	2.0	1.08	1.6
1.07	1.2	1.06	0.6	1.00	0.4	1.00	0.0	1.00	0.0	1.00	0.0	1.00	0.0

423.45801	386.88281	330.35547	194.73956	196.23735	190.13647	159.68643	133.07204	96.31378	76.51775
72.58472	69.42886	69.42886	57.04091	53.23817	53.23817	53.22879	53.22879	50.50171	50.50171
51.50171	44.26514	39.92663	39.02662	37.14291	37.14291	33.97581	33.97581	33.03554	33.03554
32.59460	31.93727	31.56357	31.56357	30.70991	30.70991	29.70688	29.70688	29.70688	29.70688
28.23198	28.05650	28.05650	27.52962	27.52962	27.52962	26.61008	26.61008	25.40749	25.40749
25.25085	24.95099	24.95099	23.74052	23.74052	23.74052	21.47621	21.47621	19.42924	19.42924
18.35307	17.74605	17.17058	16.84811	16.83889	16.27904	15.97146	15.97146	15.96880	15.96880
15.96864	15.01352	14.51695	14.36329	13.88578	13.30955	12.88021	12.88021	12.23324	12.23324
11.82863	11.77633	11.47767	11.40818	11.40667	11.00991	10.97864	10.64764	10.64764	10.64764
11.52119	11.44584	10.44584	10.13034	10.00901	10.00901	9.98040	9.98040	9.71187	9.71187
9.52863	9.39332	9.39332	9.17654	9.12494	8.67303	8.67303	8.67303	8.77997	8.77997
8.40603	8.25743	7.98573	7.98573	7.98573	7.98573	7.98573	7.98573	7.21453	7.21453
7.01413	6.96389	6.94289	6.94289	6.94289	6.82556	6.74195	6.60711	6.60711	6.47756
6.47458	6.31272	6.14661	5.94138	5.79669	5.32382	5.32382	5.32382	5.22292	5.22292
5.16090	5.14689	5.14688	5.14597	5.14597	5.14597	5.14597	5.14597	4.9741	4.9741

APPENDIX A

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL													
4.85393	4.76676	4.74811	4.71937	4.71937	4.71937	4.71937	4.71937	4.71937	4.71937	4.56247	4.56247	4.56247	4.56247
4.50908	4.23861	4.19572	4.19498	4.19498	4.19498	4.19498	4.19498	4.19498	4.19498	4.07115	4.07115	4.07115	4.07115
3.99216	3.93515	3.93267	3.86883	3.86883	3.86883	3.86883	3.86883	3.86883	3.86883	3.75733	3.75733	3.75733	3.75733
3.66997	3.62727	3.48195	3.30297	3.19373	3.19373	3.15636	3.15636	3.15636	3.15636	3.13058	3.13058	3.13058	3.13058
3.02513	3.01348	2.97069	2.67196	2.74891	2.74891	2.35968	2.35968	2.35968	2.35968	2.55498	2.55498	2.55498	2.55498
2.54074	2.42206	2.42163	2.42050	2.42050	2.42050	2.35968	2.35968	2.35968	2.35968	2.28164	2.28164	2.28164	2.28164
2.24452	2.17814	2.12915	2.0393	1.98046	1.98046	1.94237	1.94237	1.94237	1.94237	1.87835	1.87835	1.87835	1.87835
1.74144	1.71706	1.65178	1.59715	1.58410	1.57312	1.56430	1.56430	1.56430	1.56430	1.50260	1.50260	1.50260	1.50260
1.48534	1.45195	1.4032	1.36882	1.37746	1.34225	1.33195	1.33195	1.33195	1.33195	1.22857	1.22857	1.22857	1.22857
1.16096	1.16846	1.14062	1.10118	1.06460	1.01762	1.00179	1.00179	1.00179	1.00179	1.00179	1.00179	1.00179	1.00179
423.46	99.6	386.88	99.2	330.36	98.8	194.74	98.4	194.26	98.0	190.14	97.6	159.69	97.2
133.07	96.6	96.4	76.52	96.0	72.58	95.6	72.58	95.6	69.52	94.8	69.52	94.8	69.52
57.04	94.0	53.24	93.6	53.23	93.4	53.23	92.8	53.23	92.4	50.50	91.4	50.50	91.4
50.50	91.4	46.37	91.6	39.93	90.4	35.40	90.0	37.14	89.6	33.58	88.8	33.58	88.8
33.67	88.4	33.04	88.0	32.59	87.6	31.94	87.1	31.94	86.7	31.56	86.3	31.56	86.3
30.71	85.5	31.13	85.1	29.71	84.7	25.71	84.3	29.71	83.9	28.23	83.5	28.23	83.5
28.06	82.7	28.06	82.3	27.54	81.9	27.53	81.5	27.52	81.1	26.52	80.7	26.52	80.7
25.41	79.9	25.25	79.5	25.25	79.1	24.95	78.7	24.05	78.3	23.74	77.9	23.49	77.5
20.48	77.1	20.21	76.7	19.43	76.3	18.57	75.9	18.35	75.5	18.35	75.1	17.15	74.7
17.17	74.3	16.65	73.9	16.63	73.5	16.22	73.1	16.33	72.7	15.97	72.3	15.97	71.9
15.97	71.5	15.97	71.1	15.01	70.7	14.52	70.3	14.36	69.9	13.39	69.5	13.39	69.1
13.31	68.7	12.88	68.3	12.23	67.9	11.83	67.5	11.83	67.1	11.48	66.7	11.48	66.3
11.41	65.9	11.41	65.5	11.01	65.1	10.98	64.7	10.65	64.3	10.55	63.9	10.55	63.5
1.45	63.1	1.45	62.7	1.10	62.2	1.10	61.8	1.10	61.4	9.98	61.0	9.98	60.6
9.98	60.2	9.71	59.8	9.53	59.4	9.50	59.0	9.39	58.6	9.18	58.2	9.12	57.8
8.67	57.4	8.87	57.0	8.78	56.6	8.77	56.2	8.62	55.8	8.41	55.4	8.26	55.0
7.99	54.6	7.99	54.2	7.99	53.8	7.99	53.4	7.99	53.0	7.74	52.6	7.74	52.2
7.21	51.8	7.1	51.4	6.96	51.0	6.96	50.6	6.96	50.2	6.94	49.8	6.94	49.4
6.74	49.0	6.61	48.6	6.61	48.2	6.48	47.8	6.47	47.4	6.31	46.6	6.31	46.6
6.14	46.2	5.94	45.8	5.79	45.4	5.32	45.0	5.32	44.6	5.32	44.2	5.22	43.8
5.16	43.4	5.16	43.0	5.15	42.6	5.15	42.2	5.15	41.8	5.14	41.4	5.14	41.0
4.99	40.6	4.97	40.2	4.95	39.8	4.86	39.4	4.86	39.0	4.77	38.6	4.77	38.2
4.72	37.8	4.72	37.3	4.72	36.9	4.56	36.5	4.56	36.1	4.54	35.7	4.54	35.3
4.4	34.9	4.24	34.5	4.22	34.1	4.19	33.7	4.19	33.3	4.16	32.9	4.16	32.5
4.01	32.1	3.99	31.7	3.99	31.3	3.94	30.9	3.94	30.5	3.93	30.1	3.87	29.7
3.80	29.3	3.80	28.9	3.81	28.5	3.76	28.1	3.76	27.7	3.67	27.3	3.63	26.9
3.41	26.5	3.48	26.1	3.30	25.7	3.19	25.3	3.16	24.9	3.16	24.5	3.13	24.1
3.03	23.7	3.03	23.3	3.03	22.9	3.01	22.5	2.97	22.1	2.94	21.7	2.94	21.3
2.75	20.9	2.71	20.5	2.55	20.1	2.54	19.7	2.54	19.3	2.46	18.9	2.46	18.5
2.42	18.1	2.42	17.7	2.36	17.3	2.36	16.9	2.36	16.5	2.28	16.1	2.28	15.7
2.24	15.3	2.18	14.9	2.13	14.5	2.13	14.1	2.00	13.7	1.98	13.3	1.94	12.9
1.92	12.4	1.88	12.0	1.81	11.6	1.74	11.2	1.72	10.8	1.65	10.4	1.60	10.0
1.58	9.6	1.57	9.2	1.56	8.8	1.56	8.4	1.50	8.0	1.49	7.6	1.49	7.2
1.45	6.8	1.44	6.4	1.39	6.0	1.38	5.6	1.36	5.2	1.33	4.8	1.25	4.4
1.23	4.0	1.23	3.6	1.16	3.2	1.15	2.8	1.14	2.4	1.10	2.0	1.07	1.6
1.04	1.2	1.04	0.8	1.04	0.4	1.04	0.0	1.00	0.0	1.00	0.0	1.00	0.0
371.09106	345.25195	300.20972	197.19920	160.04168	147.14079	127.47146	104.52576	95.15971	88.06470	37.10910	34.54190	37.10910	34.54190
47.51169	41.61057	41.61057	41.61057	41.61057	41.61057	41.61057	38.52260	38.52260	25.19409	24.47681	24.47681	24.47681	24.47681
34.86190	30.92426	28.55966	27.60786	26.0661	26.0661	26.0661	20.90514	20.90514	20.40528	20.41617	20.41617	20.41617	20.41617
24.35988	23.11697	22.23952	21.90030	21.15593	21.15593	18.0259	16.3214	16.3214	15.9961	15.9961	15.9961	15.9961	15.9961
19.81456	19.72183	19.51364	18.40524	18.0259	18.0259	13.77634	13.35865	13.35865	12.38650	11.83195	11.83195	11.83195	11.83195
13.80394	13.77634	13.77634	13.77634	13.77634	13.77634	13.77634	13.00910	13.00910	9.50234	9.50234	9.50234	9.50234	9.50234
11.04315	10.64381	10.45258	10.45258	10.45258	10.45258	8.645170	8.45170	8.45170	8.32181	8.32181	8.32181	8.32181	8.32181
9.28823	9.04576	8.71048	8.66887	8.66887	8.66887	8.36299	8.36299	8.36299	8.36299	8.28236	8.28236	8.28236	8.28236

APPENDIX A

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL													
		197.20	97.8	160.04	97.3	147.14	96.7	127.47	96.2	107.47	96.7	87.47	96.2
377.09 99.5	345.25 98.9	300.21 98.4	197.20 97.8	160.04 97.3	147.14 96.7	127.47 96.2	107.47 96.7	87.47 96.2	107.47 96.7	87.47 96.2	107.47 96.7	87.47 96.2	107.47 96.7
104.53 95.6	59.16 95.1	48.06 94.5	48.52 94.7	47.51 93.4	41.61 92.9	41.61 92.3	41.61 92.3	41.61 92.3	41.61 92.3	41.61 92.3	41.61 92.3	41.61 92.3	41.61 92.3
41.61 91.8	41.41 91.3	38.52 90.7	38.52 90.2	37.51 89.6	36.84 89.1	36.84 88.5	36.84 88.5	36.84 88.5	36.84 88.5	36.84 88.5	36.84 88.5	36.84 88.5	36.84 88.5
30.92 88.0	28.56 87.4	27.61 86.9	28.01 86.3	26.01 85.8	25.19 85.2	24.48 84.7	24.48 84.7	24.48 84.7	24.48 84.7	24.48 84.7	24.48 84.7	24.48 84.7	24.48 84.7
26.46 84.2	26.40 83.6	24.36 83.1	23.12 82.5	22.24 82.0	21.90 81.4	21.19 80.9	21.19 80.9	21.19 80.9	21.19 80.9	21.19 80.9	21.19 80.9	21.19 80.9	21.19 80.9
20.91 80.3	20.91 79.8	20.81 79.2	20.62 78.7	20.17 78.1	19.81 77.6	19.72 77.0	19.72 77.0	19.72 77.0	19.72 77.0	19.72 77.0	19.72 77.0	19.72 77.0	19.72 77.0
19.51 76.5	18.41 76.0	18.01 75.4	16.56 74.9	16.33 74.3	16.13 73.8	15.70 73.2	15.70 73.2	15.70 73.2	15.70 73.2	15.70 73.2	15.70 73.2	15.70 73.2	15.70 73.2
15.04 72.7	13.07 72.1	13.8 71.6	13.77 71.1	13.36 70.5	13.21 69.9	13.01 69.4	13.01 69.4	13.01 69.4	13.01 69.4	13.01 69.4	13.01 69.4	13.01 69.4	13.01 69.4
12.36 68.9	11.83 66.3	11.24 67.8	11.04 67.2	11.04 66.7	10.64 66.1	10.45 65.6	10.45 65.6	10.45 65.6	10.45 65.6	10.45 65.6	10.45 65.6	10.45 65.6	10.45 65.6
10.45 65.0	10.35 64.5	9.50 63.9	9.46 63.4	9.32 62.8	9.20 62.3	9.20 61.7	9.20 61.7	9.20 61.7	9.20 61.7	9.20 61.7	9.20 61.7	9.20 61.7	9.20 61.7
9.09 61.2	9.05 60.7	8.71 60.1	8.67 59.6	8.47 59.0	8.45 58.5	8.36 57.9	8.36 57.9	8.36 57.9	8.36 57.9	8.36 57.9	8.36 57.9	8.36 57.9	8.36 57.9
8.32 57.4	8.28 56.8	8.28 56.3	8.28 55.7	8.28 55.2	8.28 54.6	8.00 54.1	8.00 54.1	8.00 54.1	8.00 54.1	8.00 54.1	8.00 54.1	8.00 54.1	8.00 54.1
7.85 53.6	7.81 53.0	7.74 52.5	7.57 51.9	7.47 51.4	7.42 50.8	7.28 50.3	7.28 50.3	7.28 50.3	7.28 50.3	7.28 50.3	7.28 50.3	7.28 50.3	7.28 50.3
7.26 49.7	7.26 49.2	7.11 48.6	6.94 48.1	6.91 47.5	6.53 47.0	6.53 46.4	6.53 46.4	6.53 46.4	6.53 46.4	6.53 46.4	6.53 46.4	6.53 46.4	6.53 46.4
6.41 45.9	6.15 45.4	6.01 44.8	5.98 44.3	5.94 43.7	5.81 43.2	5.78 42.6	5.78 42.6	5.78 42.6	5.78 42.6	5.78 42.6	5.78 42.6	5.78 42.6	5.78 42.6
5.76 42.1	5.76 41.5	5.62 41.0	5.55 40.4	5.52 39.9	5.52 39.3	5.33 38.8	5.33 38.8	5.33 38.8	5.33 38.8	5.33 38.8	5.33 38.8	5.33 38.8	5.33 38.8
5.30 38.3	5.30 37.7	5.20 37.2	5.20 36.6	5.18 36.1	5.05 35.5	5.05 35.0	5.05 35.0	5.05 35.0	5.05 35.0	5.05 35.0	5.05 35.0	5.05 35.0	5.05 35.0
6.90 34.6	6.75 33.9	6.66 33.3	6.64 32.8	6.58 32.2	6.58 31.7	6.54 31.1	6.54 31.1	6.54 31.1	6.54 31.1	6.54 31.1	6.54 31.1	6.54 31.1	6.54 31.1
4.41 30.6	4.34 30.1	4.27 29.5	4.14 29.1	4.11 28.4	4.05 27.9	4.05 27.3	4.05 27.3	4.05 27.3	4.05 27.3	4.05 27.3	4.05 27.3	4.05 27.3	4.05 27.3
6.04 26.8	3.94 26.2	3.76 25.7	3.72 25.1	3.66 24.6	3.50 24.0	3.48 23.5	3.48 23.5	3.48 23.5	3.48 23.5	3.48 23.5	3.48 23.5	3.48 23.5	3.48 23.5
3.45 23.0	3.42 22.4	3.39 21.9	3.35 21.3	3.22 20.8	3.13 20.2	3.11 19.7	3.11 19.7	3.11 19.7	3.11 19.7	3.11 19.7	3.11 19.7	3.11 19.7	3.11 19.7
3.08 19.1	3.06 18.6	3.02 18.0	2.85 17.5	2.71 16.9	2.69 16.4	2.65 15.8	2.65 15.8	2.65 15.8	2.65 15.8	2.65 15.8	2.65 15.8	2.65 15.8	2.65 15.8
2.65 15.3	2.61 14.8	2.60 14.2	2.49 13.7	2.45 13.1	2.37 12.6	2.34 12.0	2.34 12.0	2.34 12.0	2.34 12.0	2.34 12.0	2.34 12.0	2.34 12.0	2.34 12.0
2.20 11.5	2.16 10.9	2.07 10.4	1.91 9.8	1.81 9.3	1.77 8.7	1.77 8.2	1.77 8.2	1.77 8.2	1.77 8.2	1.77 8.2	1.77 8.2	1.77 8.2	1.77 8.2
1.67 7.7	1.66 7.1	1.63 6.6	1.55 6.0	1.51 5.5	1.50 4.9	1.45 4.4	1.45 4.4	1.45 4.4	1.45 4.4	1.45 4.4	1.45 4.4	1.45 4.4	1.45 4.4
1.39 3.8	1.39 3.3	1.24 2.7	1.22 2.2	1.22 1.6	1.20 1.1	1.05 0.5	1.05 0.5	1.05 0.5	1.05 0.5	1.05 0.5	1.05 0.5	1.05 0.5	1.05 0.5
1.06 C.0													

PARAMETERS	IMMEDIATELY ABOVE	VS PER CENT CONFIDENCE LEVEL	40-50	50-60	60-70	70-80	80-90	90-95
77.2496:	55.91215	46.96854	46-571	46-3.414	46-3.0414	29.59803	24.60178	21.20746
20.50146	26.50148	18.83405	18.46134	11.73412	10.77902	10.49326	5.29712	4.45169
4.35654	4.33.41	4.3041	3.66776	3.19933	2.98681	2.95833	2.64856	2.63595
2.48900	2.30642	2.30642	2.07213	2.18116	2.10765	2.16786	2.02113	2.13000
2.3646	1.87793	1.85399	1.65013	1.78352	1.68068	1.66112	1.51026	1.69756
1.41933	1.41255	1.32428	1.31795	1.31455	1.27744	1.27394	1.22421	1.21604
1.15721	1.13.46	1.1304	1.116.2	1.10913	1.0324			

APPENDIX A

27.32201 29.97807

30-96494
40-86348

7 - 37496 63.666117

APPENDIX A

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL						
	122.39	98.5	70.37	97.1	63.86	95.5
30.96	87.9	86.4	27.32	84.8	53.0	83.3
18.59	77.3	17.6	75.8	10.69	74.2	0.39
4.45	66.7	4.38	65.2	4.36	63.6	4.40
3.32	56.1	3.23	54.5	3.29	53.0	2.96
2.73	45.5	2.66	43.9	2.37	42.4	2.32
2.13	34.8	2.06	33.3	2.26	31.8	1.98
1.70	24.2	1.66	22.7	1.60	21.2	1.60
1.42	13.6	1.41	12.1	1.31	10.6	1.28
1.13	3.0	1.09	1.5	1.05	0.0	1.05

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL						
	380.30542	124.22978	63.05457	40.56848	22.08990	21.84456
17.58311	16.56311	16.56728	16.09920	16.02228	15.52882	15.46913
13.74413	12.75575	12.29514	11.84463	11.04985	10.73200	10.45419
9.47012	9.40216	9.11125	8.94400	8.40728	8.21656	8.04960
7.47141	7.47142	7.33353	7.28910	7.23243	7.12102	6.832264
5.74933	5.68727	5.36640	4.96919	4.94546	4.70266	4.68098
4.27261	4.16498	4.46412	4.01810	4.00557	3.91910	3.74478
3.56051	3.46182	3.41046	3.37311	3.32589	3.32559	3.23645
3.20424	3.19161	3.08865	2.71590	2.65255	2.52757	2.49652
2.29986	2.26673	2.17557	2.13630	2.11191	2.11191	2.08057
2.01244	1.986	1.89965	1.87239	1.85455	1.80133	1.79437
1.72480	1.71791	1.62274	1.61022	1.61499	1.56633	1.565640
1.24236	1.24236	1.24238	1.23936	1.20736	1.14987	1.05595
1.03655	1.00630					1.03855

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL						
	380.31199	126.23985	63.05797	40.57970	22.08995	21.84457
21.36	93.9	16.38	93.2	17.58	92.4	17.58
16.02	88.6	15.53	87.9	15.49	87.1	13.48
12.76	83.1	12.3	82.6	11.84	81.8	11.05
9.77	78.0	9.47	77.3	9.47	76.5	9.40
-22	72.7	8.5	72.0	8.05	71.2	7.91
-3.3	67.4	7.29	66.7	7.23	65.9	7.12
5.79	62.1	5.75	61.4	5.69	60.6	5.37
4.6	56.8	4.60	56.1	4.55	55.3	4.35
4.02	51.5	4.01	50.8	3.92	50.0	3.74
3.56	46.2	3.48	45.5	3.41	44.7	3.37
3.21	41.9	3.21	41.2	3.21	39.4	3.20
2.69	35.6	2.65	34.8	2.53	34.1	2.50
2.25	30.3	2.18	29.5	2.14	28.8	2.14
2.03	25.0	2.01	24.2	2.01	23.5	1.99
1.87	19.7	1.79	18.9	1.76	18.2	1.76
1.62	14.6	1.62	13.9	1.61	12.9	1.56
1.3	5.1	1.24	8.3	1.24	7.6	1.24
1.15	3.8	1.06	3.0	1.05	2.3	1.04

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PARAMETERS IMMEDIATELY ACCURATE VS. PER CENT CONFIDENCE LEVEL			
0.65-94565	282-86792	143-57362	92-37343
18-31707	17-78411	17-76091	13-68148
9-16490	8-75941	6-52678	8-42630
6-69847	6-53246	6-48177	6-15238
4-80876	4-61902	4-37376	4-22275
3-55222	3-55222	3-39112	3-12740
2-11996	1-91352	1-90978	1-87644
1-56370	1-54578	1-40733	1-40733
1-17800	1-13147	1-13147	1-13106
0.65-95-98.9	282-86792	143-57362	92-37343
29-94-91.1	29-70-90.0	23-8-88.9	12-96-96.7
12-95-83.3	11-43-82.2	11-26-81.1	11-02-80.6
8-76-75.6	8-53-74.4	8-43-73.3	8-20-72.2
7-07-67.8	7-54-66.7	6-70-65.6	6-53-64.4
5-68-60.0	5-19-58.9	5-15-57.8	4-85-56.7
4-37-52.2	4-22-51.1	4-16-50.0	4-12-48.9
3-61-44.4	3-55-43.3	3-54-42.2	3-35-41.1
2-81-36.7	2-78-35.6	2-36-34.4	2-12-33.3
1-82-28.9	1-61-27.4	1-78-26.7	1-74-25.6

APPENDIX A

1.56	21.1	1.55	20.0	1.41	18.9	1.41	17.8	1.41	16.7	1.39	15.6
1.36	13.3	1.29	12.6	1.27	11.1	1.18	10.0	1.13	8.9	1.13	7.8
1.18	5.6	1.17	4.4	1.17	3.3	1.05	2.2	1.01	1.1	1.01	0.0

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL	CONFIDENCE LEVEL										
	92.38	92.57	92.74	92.91	92.96	93.06	93.14	93.23	93.31	93.40	93.53
23.59770	224.74005	92.30164	40.62103	49.74396	28.13916	28.09250	23.81023	23.80603	23.7909		
17.76569	12.79053	11.37205	10.05147	9.37972	8.99117	8.89917	8.76173	8.76019			
8.52754	8.17366	7.21554	7.01053	7.03603	6.92949	6.92949	6.70015	6.69997	6.69473		
6.51746	6.46752	5.81957	5.77481	5.65502	5.56198	5.30928	5.23481	5.15396	5.15305		
5.1.179	4.88810	4.85243	4.54531	4.46958	4.39674	4.12244	4.11983	4.11983	4.11983		
3.4.4758	3.00509	3.55314	3.12712	3.03165	3.02572	2.96639	2.94911	2.81641	2.81392		
2.66770	2.66532	2.28155	2.27265	2.05339	2.02254	2.03994	1.87627	1.75901	1.75870		
1.71138	1.56356	1.56329	1.54591	1.49258	1.48319	1.40721	1.40721	1.40721	1.40721		
1.38614	1.27131	1.22344	1.23259	1.11240	1.11240	1.06613	1.06613	1.06613	1.06613		
546.56929	546.57969	224.74	97.8	90.62	95.6	49.74	94.4	26.14	93.3	26.09	92.2
23.81	91.1	23.81	50.0	23.79	88.5	23.80	87.8	17.77	86.7	11.37	84.4
10.05	83.3	9.38	62.2	8.9	81.1	8.90	80.0	8.76	78.9	8.75	76.7
8.53	75.6	8.1	74.4	7.22	73.3	7.11	72.2	7.04	71.1	6.70	68.9
6.70	67.8	6.69	66.7	6.52	65.6	6.47	64.4	5.88	63.3	5.77	62.2
5.56	60.0	5.31	58.9	5.23	57.6	4.15	56.7	5.15	55.6	5.15	54.4
4.85	52.2	4.55	51.1	4.45	50.0	4.40	48.9	4.12	47.8	4.12	45.6
3.82	44.6	3.82	43.3	3.81	42.2	3.55	41.1	3.13	40.1	3.03	37.8
2.97	36.7	2.95	35.6	2.81	34.4	2.81	33.3	2.67	32.2	2.67	31.1
2.27	28.9	2.05	27.6	2.02	26.7	2.01	25.6	1.98	24.4	1.76	22.2
1.71	21.1	1.56	20.0	1.56	18.9	1.55	17.6	1.49	16.7	1.48	15.6
1.41	13.3	1.41	12.2	1.39	11.1	1.39	10.0	1.27	8.9	1.22	7.8
1.11	5.6	1.11	4.4	1.08	3.3	1.07	2.2	1.07	1.1	1.07	0.0

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL	CONFIDENCE LEVEL											
	57.31	97.6	47.17	95.2	47.17	92.9	36.16	90.1	28.79	88.1	25.40	85.7
12.27977	9.4825	6.19897	4.71661	4.71661	4.65116	3.25581	3.13416	3.08466	2.73338	2.73338		
2.6909	2.58290	2.55252	2.54715	2.54715	2.16964	2.03673	1.94415	1.91935	1.85247	1.85247		
1.74603	1.66098	1.65305	1.49493	1.49493	1.43264	1.33244	1.29054	1.21620	1.07446	1.07446		
1.03127	1.00495											
57.30559	47.16605	47.16605	36.16063	28.79031	25.40321	23.99173	22.34060	21.59273	12.61418			
57.31	97.6	47.17	95.2	47.17	92.9	36.16	90.1	28.79	88.1	23.99	83.3	
22.04	81.0	21.59	78.6	12.61	76.2	12.28	73.8	9.05	71.4	6.72	66.7	
4.72	64.3	4.65	61.9	3.26	59.5	3.13	57.1	3.06	54.8	2.73	52.4	
2.58	47.6	2.55	45.2	2.55	42.9	2.54	40.5	2.17	38.1	2.04	35.7	
1.92	31.0	1.85	26.6	1.75	26.2	1.66	23.8	1.65	21.4	1.49	16.7	
1.43	14.3	1.32	11.9	1.29	9.5	1.22	7.1	1.07	4.8	1.01	2.4	

PARAMETERS IMMEDIATELY ABOVE VS PER CENT CONFIDENCE LEVEL	CONFIDENCE LEVEL											
	74.72659	74.72659	57.30051	57.29041	36.23682	31.97365	31.97365	27.17761	22.33865	19.98502		
12.27849	5.82121	9.64745	7.47266	7.47266	4.65158	4.09217	4.09217	3.68252	3.43742			
3.39720	3.25610	3.19737	2.73412	2.41579	2.09059	2.0372	1.97822	1.87432	1.74518			
1.65220	1.61620	1.59217	1.54464	1.49479	1.47180	1.42251	1.32232	1.30260	1.22765			
1.07438	1.01118											
74.73	97.6	74.73	95.2	57.3	92.9	57.29	90.5	36.24	88.1	31.97	85.7	

APPENDIX A

27.18	81.1	22.4	78.6	19.99	76.2	12.28	73.8	9.82	71.4	9.05	69.0	7.47	66.7
7.47	64.3	4.65	61.9	4.09	59.5	4.06	57.1	3.88	54.8	3.44	52.4	3.40	50.0
3.26	47.6	3.20	45.2	2.73	42.9	2.42	40.5	2.09	36.1	2.02	35.7	1.98	33.3
1.87	31.0	1.75	28.6	1.65	26.2	1.62	23.8	1.59	21.4	1.54	19.0	1.49	16.7
1.47	14.3	1.43	11.9	1.32	9.5	1.30	7.1	1.23	4.8	1.07	2.4	1.01	0.0

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